DOCUMENT RESUME

ED 271 391 SO 017 447

AUTHOR Burstein, Leigh; Hawkings, John
TITLE An Analysis of Cognitive, Non-Cognitive, and Behavioral Characteristics of Students in Japan.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE Feb 86
CONTRACT NIE-P-85-3036
NOTE 171p.; For other studies in this series on education in Japan, see SO 017 338 and SO 017 443-460.
PUB TYPE Reports - Descriptive (141)

EDRS PRICE MF01/PC07 Plus Postage.
DESCRIPTORS *Academic Achievement; *Academic Aptitude; *Area Studies; *Cognitive Structures; Elementary Secondary Education; Foreign Countries; *Student Characteristics; Student Evaluation; *Student Motivation
IDENTIFIERS *Japan; United States Study of Education in Japan

ABSTRACT

A review and conceptual analysis of the literature on the characteristics of students in Japan and of the factors influencing those characteristics was conducted. Information from both English and Japanese sources about cognitive, non-cognitive, and behavioral characteristics of students and factors influencing them was sought regarding students from both elementary and secondary levels and for special populations of dropout, gifted, learning disabled, and private education students. Beyond the literature analysis, a judgement was made concerning the quality and credibility of each citation source. Two major bibliographic sources were searched: ERIC and the Social Science Citation Index; popular accounts, best sellers, the press, major books, and comparative studies were also examined. Japan emerges from these studies as a multi-dimensional society with elements that are both unique and comparable to other modernized and industrialized nations. What does not emerge from these studies, however, is any clear indication or data to explain the inordinately high levels of achievement of Japanese students. Twenty-one pages of references and 13 tables complete the document. (BZ)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED271391

AN ANALYSIS OF COGNITIVE, NON-COGNITIVE, AND BEHAVIORAL CHARACTERISTICS OF STUDENTS IN JAPAN

Leigh Burstein
John Hawkins

Graduate School of Education
University of California, Los Angeles

February 1986

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

SO017447

The work upon which this publication is based was performed pursuant to Contract No. NIE-P-85-3036 of the National Institute of Education. It does not, however, necessarily reflect the views of that agency.

TABLE OF CONTENTS

Sources of Citations 3
Bibliographic Search Services 3
"Popular Accounts," Best Sellers, and the Press 6
"Popular Accounts," Best Sellers, and the Press 6
Journalistic Accounts 7
"Popular Accounts" 8
Major Books 9
"Comparative Studies" 14
Constraints on the Literature Analysis 16

Cognitive Characteristics 18
IEA First International Mathematics Study 18
Description of Sampling and Measures 19
Results 25
Summary 25
IEA Six Subjects Survey of Science Achievement 26
Description of Sampling and Measures 28
Results 31
Summary 33
The Second International Mathematics Study 35
Description and Sampling of Measures 39
Results 46
Summary 49
The Harnisch-Sato Study of High School Mathematics 51
Stevenson et al. 52
Description of Sample and Measures 56
Results 58
Summary 60
Hess, Azuma et al. 61
Descriptions and Sample of Measures 64
Results 66
Summary 68
Lynn 74
Summary of the Cognitive Evidence--What's There, What's Missing 83

Non-Cognitive and Behavioral Characteristics 85
New Data Sources 85
HS&B in Japan 87
Third World Youth Survey 88
Information About Specific Attributes 88
Self-Concept 91
Locus of Control and Attributions 97
Toward School and Subject Matter 99
Educational Expectations 100
Other Attitudes 101
Sample of Behavior 104
Creativity 106
Summary of Non-Cognitive Evidence: Perplexing Patterns ..106

Recently, a government commission was appointed to assess the nation's educational system and report back to the executive branch how they viewed the educational system against world standards. The twenty-five member commission reported that the current educational system was outmoded, uncreative, rigid and inhibiting. More specifically, the commission reported that

> Despite its merit, the main thrust of this country's education has been to have students memorize information and facts. The development of the ability to think and judge on one's own and the development of creativity has been hampered. Too many stereotyped persons without marked individuality have been produced." (Clyde Haberman, "Japan's School System Fails to Pass a Hard Nosed Test," New York Times, June 12, 1985, p. F-1, reporting the results of the Japanese government appointed Ad Hoc Council on Education).

Although in the United States, we have recently had a spate of similar government reports on our educational system, the report described above was commissioned by the Japanese government to assess their own system; the results were quite negative. This national judgment comes at a time when we in the United States are seeking answers to our many educational problems and in many cases are looking to the Japanese as a model and possible answer.

The contrast is interesting-- we seeking models and answers from the Japanese and the Japanese questioning their own system; often reflecting on ours as more humane, creative, and advanced. Analysis of the Japanese experience comes from many quarters: Japan scholars in this country, educators in the United States, international teams studying educational performance, and Japanese commentators themselves. In this document we attempt to assess the quality, quantity, scope, content, and general

usefulness of much of this literature. In doing so, we hope that we will have put in perspective the current debate on education in the United States vis a vis the perceived "educational miracle" in Japan.

Our task was to conduct a review and conceptual analysis of the extant literature on the characteristics of students in Japan and of the factors influencing those characteristics. The breadth of the charge was intended to be exhaustive. Both qualitative and quantitative information from English and Japanese sources about cognitive, non-cognitive, and behavioral characteristics of students and factors influencing them were of interest. Moreover, this information was desired about students from both elementary and secondary levels and for special populations of dropouts, gifted, learning disabled and private education students. In addition to the literature analysis, we were asked to judge the quality and credibility of each citation source.

As one might expect given the enormity of the charge, the chasm between desirable and deliverable is quite large. Given the resources and time allotted for the project, we were unable to pursue all elements of the review and analysis with equivalent determination and depth of penetration. In some cases, the reports simply weren't obtainable within a reasonable time frame; this proved to be true for certain governmental reports (typically written in Japanese) and fugitive drafts from ongoing studies of Japanese students. In other instances, there were hardly any data to begin with; rather the judgment or

interpretation about some aspect of Japanese students was based only on the observations and impressions of a (typically) knowledgeable observer of Japanese society and educational system. While reports of the latter type may be no less accurate than those based on empirical data collections across a number of students and preferably locales, the fact remains that oftentimes it is hard to document the source of the interpretations generated.

Sources of Citations

Rather than continue to recite the litany of what we were unable to do, we instead describe our literature search effort and its yield and the implications of that yield for the substance of this report. The primary sources of citations were the standard ones: bibliographic search services, chaining from the references in well-known publications and in citations found through the bibliographic search, and direct solicitation of reports and citations from selected scholars involved in major comparative studies of Japanese and American schooling. Our project monitor also passed along references and unpublished reports that he obtained through his involvement in the U.S. Japan Study Group. Finally, a few Japanese reports were obtained from direct contacts with the Japanese Ministry of Education (Hawkins) and through work on the Second International Mathematics Study (Burstein).

Bibliographic Search Services

Two major bibliographic search services were examined during the review. Early in the project, both the CIJE (typically

journal articles) and RIE (more fugitive documents and reports) listings of the ERIC system were queried for any citation on elementary and secondary education in Japan for the period 1966 to the present (June 1985). This search yielded 245 citations with their accompanying abstracts (when available). We then independently examined the citation listing to select those reports that fell within the bounds of our assignment. Basically, citations were eliminated from further consideration if they appeared to contain no data on student characteristics (typically a description of a specific curriculum project or unit) or were unlikely to be accessible during the timeframe allotted for the review (e.g., dated government reports in Japanese, unpublished conference proceedings on topics tangential to the present purpose). We then divided the remaining citations according to our chosen report responsibilities and sought to obtain copies of available documents. The total yield from this effort was approximately 40 citations which contributed to the writing of this report. (There were roughly a similar number that were obtained but were eliminated upon closer examination.)

The other major bibliographic source that was searched was the Social Science Citation Index (SSCI). This search was more limited. Starting with 1985 and working backwards, all citations involving descriptors such as "Japanese education, Japanese schooling, Japan achievement, Japan attitudes, Japan students" were identified. Then potentially pertinent references cited in the articles identified by these descriptors were also identified. The resulting list of reports (roughly 50 during the

period 1982-1985) were culled for overlaps with the ERIC citations. Book reviews and tangentially relevant references were also eliminated, and then a library search for the remaining citations was carried out. The yield from this effort was relatively modest. After elimination of overlap with the ERIC search, only a few citations from the psychology literature remained (mainly about the comparative intelligence debate and studies conducted by Stevenson and his colleagues). Overall less than 10 new references were identified through this examination. Moreover, since the number of citations diminished rapidly as we went back in time, the decision was made to stop arbitrarily after considering only 4 years of the SSCI.

To sum up our examination of two major bibliographic sources that contain citations to reports addressing educationally relevant literature, and presumably a subset of the literature dealing with the characteristics of Japanese students, yielded less than 50 separate, pertinent citations (that we could identify and obtain). This does not mean that there are only a relative handful of papers with some modicum of information regarding Japanese education. But it does appear that only a limited subset (written in English) contain minimally acceptable amounts of empirical data on Japanese students. The number would have been somewhat greater if we had been able to obtain more of the documents produced (in Japanese) by various Japanese governmental agencies, especially if these reports contained more than the raw statistical tabulations that predominate in the few reports we examined. But once one gets beyond a few widely cited books (Cummings, Reischauer, Vogel, Rohlen) and a limited number of highly prolific (in terms of

primary and secondary reports of data analyses) studies (we return to the latter shortly), the remaining pickings are rather slim.

"Popular Accounts", Best Sellers, and the Press

In addition to journal articles and reports of empirical investigations, there were a number of other sources of information on Japanese education that were considered. In this section we identify these sources and characterize how they were used in our review and analysis.

Journalistic accounts. Given the strong belief within the American business community that the quality of the Japanese educational system has a great deal to do with their high level of economic productivity, it is not surprising that there has been substantial journalistic coverage of Japanese performance and its presumed antecedents in recent years. Major news magazines (Newsweek) and newspapers (New York Times, Dallas Times Herald) have published accounts which mix secondary reports of highly aggregated results (rankings derived from "national total or average scores") from comparative empirical studies with journalistic observations and interviews (with Japanese governmental, business, and educational leaders as well as students, teachers, administrators and parents) to weave oftentimes seductively clear portrayals of an effectively and efficiently functioning system. (The Japanese print media also provide especially heavy coverage of educational issues, in much greater detail and frequency than the annual results from state and district testing programs, but with more critical judgments about their system's success.)

These journalistic accounts heighten public awareness and interest in the quality of American education in comparison with that in Japan. As such they have served to build the consensus for action on the educational front and have focussed policy makers' attention on the questions of educational goals, accomplishments and progress. Nevertheless, the empirical support for journalistic judgments of the comparative efficacy of Japanese education tends to be either limited, unclear, or dated. By either the standards of scholarship or of policy analysis, the documentary support for journalistic interpretations is typically weak. As a consequence, while our analysis of the characteristics of Japanese students will consider many of the same themes as have appeared in newspapers and magazines and will, in a few cases, examine the same data sources, the journalistic reports themselves will receive only scant coverage in what follows.

"Popular accounts". Within the educational literature, there have also been numerous citations regarding Japanese education in journals known more for popular accounts of educational issues than for the reporting of in-depth empirical investigations. Brief articles in journals such as Phi Delta Kappan (e.g., Cogan, 1984; Kirst, 1981; Walberg, 1984) and Educational Leadership (e.g., Schiller & Walberg, 1982) provide American educators important glimpses of the educational environment in Japan. As with the journalistic treatments, these popular accounts serve to focus attention, in a lucid broadly accessible way, on issues and implications from the Japanese educational system that might

reflect on American educational reform efforts. These accounts seldom contain the empirical evidence for their interpretations, but their citation documentation is generally superior to that for newspaper and magazine articles.

Our use of these popular accounts of Japanese education (as well as their more scholarly essay counterparts in journals such as Daedalus (Walberg, 1983) and Public Interest (Lerner, 1982; White, 1984; Wolf, 1983)) has been more extensive than was the case with newspaper and magazine citations. These reports tended to provide reasonably supported analyses regarding issues such as the relative performance of Japanese and American students, the societal, social, and educational antecedents of Japanese performance, and the implications of Japan's educational experiences for the United States. In most instances our analyses will draw upon themes derived from such accounts and examine the documentary support for this "popular wisdom". In addition, we depended upon many of these sources for the citations necessary to begin the documentation process.

Major books. The third source of citations considered in this section are the major books that devote significant attention to Japanese education. The emphasis here is on the word "significant". Reischauer's widely cited treatises on Japan consider education as part of the backdrop for characterizing Japanese society and culture rather than the other way around (our present interest); Vogel's (1979) concern for Japanese education is more as an explanation of rapid economic advancement than as a primary target of his analysis. Neither of these books, nor

nor similar treatments from this genre, figured significantly in our review efforts.

Two relatively recent book-length treatments of schooling in Japan (Cummings, 1980; Rohlen, 1983) were considered in some depth in our review. These two works evolve from a comparative education tradition and mix on-site observation and interaction within the Japanese society and educational system with syntheses of the empirical literature to present a vivid picture of a significant segment of the school system.

Rohlen's study is particularly penetrating. He combines what are essentially case studies of five Japanese high schools of different types (in terms of academic orientation) within the same community with survey data gathered from samples of students within these schools to provide a micro-examination of the nature and consequences of educational stratification in Japanese secondary schools. We will use both Rohlen's empirical data and his insights in our own analyses.

"Comparative Studies"

Despite the availability of the diverse array of information sources already described, the core of a literature analysis of the sort intended here (i.e., an examination of student characteristics and factors influencing them) must be the body of reports on empirical investigations conducted pertinent to the topic. Whether one views the scholar's (or analyst's) role as reflective (i.e., perceptions and interpretations derived from empirical evidence) or proactive (perceptions and beliefs derived from conceptual, philosophical and theoretical analyses determine the selection of empirical evidence used to support

interpretations), or somewhere in between, at some point there is a need for empirical data. The data used by the analyst may have been self-collected expressly for the purpose in a given report or gathered by others for entirely different reasons. Regardless of who and why it was collected, questions of data quality and pertinence to the issues of interest warrant attention.

As our work progressed, we were struck by several features of the extant empirical literature on the characteristics of Japanese students that to a great extent determined our analytical strategy. First, there is not a substantial contemporary empirical literature on the characteristics of pre-collegiate Japanese students written in English. The final yield of books, journal articles, government reports, conference presentations and unpublished reports considered in our analysis was less than 100 citations. Second, even this number is misleading. A rough count suggests that almost half of our references rely on a total of only seven distinct data collection efforts for their empirical evidence (see below). Third, of the remaining studies that do not rely on one of the "seven", very few are based on significant samples (in terms of size and representativeness) of Japanese students. Moreover, the reports on these other samples tend to be unpublished and not very well documented (in part because they are recent additions to the literature).

The primary implication of the above is that our analysis will be strongly influenced by the nature and calibre of only a few primary data sources. The seven sources alluded to above

differ in a number of ways. Three data bases were generated by cross-national studies of educational achievement collected under the auspices of the International Association for the Evaluation of Educational Achievement (IEA; International Study of Achievement in Mathematics (Husen, 1967; hereafter denoted as FIMS); The IEA Six Subjects Survey of Science Achievement (Comber & Keeves, 1973); The Second International Mathematics Study (Travers et al., in progress; hereafter denoted as SIMS); A Second International Science Study is currently underway but the data are unavailable at this time. The IEA studies collected primarily survey and achievement test data on large representative samples of students at fixed age or grade levels along with survey data from teachers and building administrators in the participating students' schools. As a set, IEA surveys are the most widely used empirical evidence in analyses of the comparative educational performance of Japanese and American students even though data from FIMS is over 20 years old and the Science data were collected prior to 1970. Moreover, IEA data on Japan is limited to science and mathematics even though cross-national studies in the areas of mother tongue, literature, civics education, English as a foreign language, French as a foreign language, and written composition have also been carried out.

The IEA data bases are unique resources for the comparative examination of Japanese and American schooling in mathematics and sciences. The only other significant data source that has attempted to cover the same general terrain comes from the study of mathematics productivity carried out by Harnisch and Sato.

Their data were collected from a nationally representative sample of Japanese upper secondary school students by the Nippon Electric Company (Sato's employer) and a random sample of Illinois high school students collected through that state's assessment program.

The remaining data sources involve smaller and possibly less representative samples. The study conducted by Harold Stevenson and his colleagues compares cognitive abilities, and reading and mathematics performance of first and fifth grade students from Japan, the United States, and Taiwan. Their subjects were a stratified random sample of students from 40 classrooms (20 at each grade level) in 10 elementary schools selected to randomly represent the elementary schools in a single metropolitan area in each country. The Japanese (Sendai) and American (Minneapolis) cities were chosen to be comparable in size, general economic conditions, and cultural status within their countries (essentially economically successful cities with little heavy industry and small minority populations). In addition to test data, detailed curriculum analyses, parent interviews and classroom observations were conducted. In essence, the Stevenson et al study involved a more fine-grained analysis of learning and its correlates than the larger surveys but accomplished this precision through intense study of presumably comparable but non-nationally representative samples.

With the exception of the IEA SIMS study, all the sources considered involved strictly cross-sectional data collection. The only major comparative longitudinal data source identified

involved the collaboration of Robert Hess and Hiroshi Azuma in parallel studies of cognitive socialization and development. Hess, Azuma and their colleagues gathered primarily cognitive ability and developmental data collected in a comparable way although not always using the same instruments. Their study samples were quite small, consisting initially of 58 Japanese and 67 American mother-child pairs starting when the children were approximately 3 years and 8 months of age. All American children were Caucasian and were initially recruited from preschools and day care centers in the San Francisco Bay area. The locale from which the Japanese families was selected is unspecified in the various reports. This study had two rounds of data collection. During the initial round (conducted during the period 1972-1977), interview, observation and cognitive task data were gathered from parents and children when the children were ages 3 years 8 months old, 4, 5, and 6. At the follow-up phase (involving 47 American and 44 Japanese families), Japanese children were age 11 and American children age 12. Maternal child rearing practices and causal attributions and their relationships to cognitive development were the primary substantive foci of the investigation. The tradeoffs between power and representativeness, on the one hand, and detailed depiction of development, on the other, are obvious for the Hess-Azuma study. Nevertheless, it remains the only longitudinal data base of any consequence comparing Japanese and American cognitive development prior to and through the elementary school years.

The last multiply cited data source from our list is less of a data collection effort than a data interpretation debate.

Richard Lynn started the debate by concluding from the Japanese standardization of the Wechsler Intelligence Scale for Children (WISC; Lynn, 1977, 1982) that Japanese children have significantly higher mean IQ's than American children and the difference is growing. This interpretation launched a series of exchanges with other scholars in the journal Nature (Flynn, 1983; Lynn, 1983; Stevenson & Azuma 1983; Vining, 1983). Despite its secondary use of the WISC data, we consider Lynn's handling of these data to be the primary source for our analysis. And, as intelligence is one of the characteristics of interest in our review and there is very little comparative data other than this source (and others already cited), we will examine Lynn-generated intelligence debate in our later discussion.

Constraints on the Literature Analysis

Before turning to the examination of specific categories of characteristics of Japanese students, it is important to make clear certain conditions we placed on our selection of literature. First, we decided to consider only the most contemporary literature in characterizing Japanese students. With the exception of those citations that contribute to the historical context that accounts for the current goals and structure of Japanese schooling, virtually all of the sources we consider were published during the past 20 years. Even among these citations, those referring to investigations begun during the past 10 years predominate. At certain points, data gathered in the early 60's (or earlier) will be cited (e.g., the First International Mathematics Study (FIMS; Husen, 1967)). When

this occurs, the purpose is to establish educational and social trends for the populations of interest.

The justification for a concentration on contemporary literature is that while a knowledge of the past may be necessary to understand the present, our purpose in conducting this examination is to ascertain the current status and functioning of Japanese society with respect to the attributes of its children. By modern American standards, the Japanese educational and social system has gone through a long period of stability, certainly much more so than American society during the past 20 years. Moreover, the educational contrast between Japan and the United States during this period is the source of recent interest among American political, business, and educational leaders.

The second major condition placed on our literature selection was that whenever possible, the empirical support for a given report's analysis and interpretations should include comparative data for both Japan and the United States. This did not necessarily mean that the studies had to collect data in both countries or use the exact same questions. Rather our concern here was that implications of isolated facts about Japanese students (e.g., the percentage of students from a given study who could add complex fractions) are difficult to interpret from an American perspective without some notion about comparable attributes in our own society. While we are certainly aware that exact comparability of samples and questions across cultures is virtually impossible, there seems to be no way to avoid comparison of the results from the two countries to properly inform educational policy and practice in the United States.

In essence, then, we are conducting an analysis of the contemporary literature on characteristics of Japanese students with explicit emphasis on empirical evidence that will allow comparison with similar attributes of students in the United States. In this way we hope to arrive at insights that are most likely to shed light on the implications of Japanese data for American educational reform.

Cognitive Characteristics

Virtually every newspaper article, book, and popular account dealing with the achievements of Japanese students point to their pattern of exceptional performance in comparison to students from other countries. For the most part, these judgments (by Cummings (1980), Lerner (1982), Rohlen (1983), Schiller and Walberg (1984) and Walberg (1983), among others) are based on secondary interpretations of the overall test performance results from the First International Mathematics Study (Husen, 1967) and the IEA Six Subjects Science Study (Comber and Keeves, 1973). Thus the primary basis for most contemporary judgments about the exceptionality of Japanese schooling rests on highly aggregated data in a limited range of subject matter from studies conducted over 15 years ago.

Given the purpose of our analysis, it is reasonable to approach our task by addressing several specific questions that get to the heart of the issue of whether the evidence of Japanese academic superiority is solid or illusory. To us the pertinent questions are as follows:

1. Are recent accounts of the Japanese performance on the earlier IEA studies an accurate and complete portrayal of the data from those studies?
2. If so, do the Japanese accomplishments in the earlier IEA studies persist, as reflected in more recent IEA data?
3. Is there comparative evidence, separate from the IEA studies, that corroborates or contradicts this body of work?
4. With respect to a given content area (e.g., mathematics), is the performance of Japanese students uniformly or differentially exceptional?
5. Is the performance of Japanese students uniformly exceptional (comparatively) across all content areas?
6. Is the performance of Japanese students uniformly exceptional for all age groups?
7. Aside from measures of academic achievement, what evidence is available about the comparative cognitive abilities of Japanese students?
8. How uniform is the performance of students within Japan? Do certain segments (defined by sex, social class, ethnicity, etc.) exhibit higher achievement than others?

The evidence available to address this set of questions is derived primarily from the seven studies mentioned earlier. The major sources of cognitive performance information are described briefly in Table 1. In the remainder of this section, we present the basic results from each study and then attempt to synthesize the results across studies to respond to the questions regarding

cognitive performance of Japanese students.

IEA First International Mathematics Study.

The First International Mathematics Study (FIMS; Husen, 1967) collected data on mathematics performance and other characteristics from students, teachers, and other school officials from twelve countries (Australia, Belgium, England, Finland, France, Germany, Israel, Japan, The Netherlands, Scotland, Sweden, United States). Actual data collection was carried out during the period January through June 1964 in most countries. The target populations of students were 13-year-olds (Population 1a), students in the grade group corresponding to 13-year-olds (Population 1b), students in their final year of secondary school taking a course of study with a significant mathematics emphasis (Population 3a; this group will be referred to as the mathematics students below), and students in their terminal year of secondary school taking a course of study that does not have a significant mathematics emphasis (Population 3b; referred to as the non-mathematics students below). Japan apparently surveyed a single sample of 13-year-olds so that its data for Populations 1a and 1b were the same. In what follows, we will use the age (Population 1a) rather than grade-based sample for our analysis.

Description of Sampling and Measures. The chapter on sampling in the report (written by Gilbert Peaker) does not provide substantial detail about the procedures and execution in individual countries. Apparently, the Japanese sample was a two-stage (schools and students) stratified random sample of each

population, and according to Peaker, was executed exceptionally well. (The U.S. chose a three-stage stratified sample (areas (presumably districts), schools, students) and was reasonably successful in its execution according to Peaker.)

The test administered to 13-year-olds contained 70 items (10 completion, 60 multiple choice) covering primarily topics in arithmetic, algebra, and geometry. In the report subscores are also provided for items categorized as lower process, higher process, word problems (labeled "verbal" in the report), computational, new mathematics, basic and advanced arithmetic. The nonmathematics group of terminal year students (Population 3b) were administered a 58-item test covering analytical geometry, analysis, and sets in addition to the content areas contained in the test taken by 13-year-olds. Twenty three items were common to Populations 1a, 1b, and 3b. In addition to scores reported by content area, subscores in all categories used with the 13-year-olds except basic arithmetic were also reported. The terminal year mathematics students (Population 3a) were administered a 69-item test covering the content areas of algebra, geometry, analytical geometry, analysis, sets, logic, and calculus. Twenty one items were common between the tests taken by Populations 3a and 3b. As with the other populations, subscores of items categorized as lower process, higher process, word problems, and computational were also reported for the terminal year mathematics students.

Results. The FIMS performance of Japanese students can be summarized in several ways. The mean and standard deviation on the total test for each population are reported in Table 2 along

with the corresponding U.S. and international (pooled across all countries) values. The most striking result in the table is exceptional average performance of Japanese 13-year-olds. Their mean of 31.2 (standard deviation=16.9) represents an average of 3.5 items more correct than the next closest country (Belgium) and almost twice as many as U.S. students were able to answer on average. This performance is more than .75 standard deviations higher than the international mean (in units defined by the international standard deviation) and a full standard deviation higher than the corresponding U.S. mean. Japanese 13-year-olds also exhibit high variability in performance; only England is similar in this respect. Nevertheless, even the lowest performing students in Japan are doing well relative to 13-year-olds from other countries (See Figure 1). The 10th percentile of the performance distribution of Japanese students corresponds to roughly the 25th percentile internationally and in the U.S. while the Japanese 25th percentile corresponds approximately to the 50th percentile internationally and 60th percentile in the U.S. Only about 10 percent of American 13-year-olds (90th percentile) answered as many questions correctly as the typical Japanese student (50th percentile).

Comparisons of terminal year Japanese performance to the international means are less spectacular as might be expected given the selectivity of many of the national educational systems represented here. According to the IEA reported figures (Husen, 1967, Volume I, Table 13.5, p.237), Japan retained 57% of its students into the terminal year of secondary school with 8%

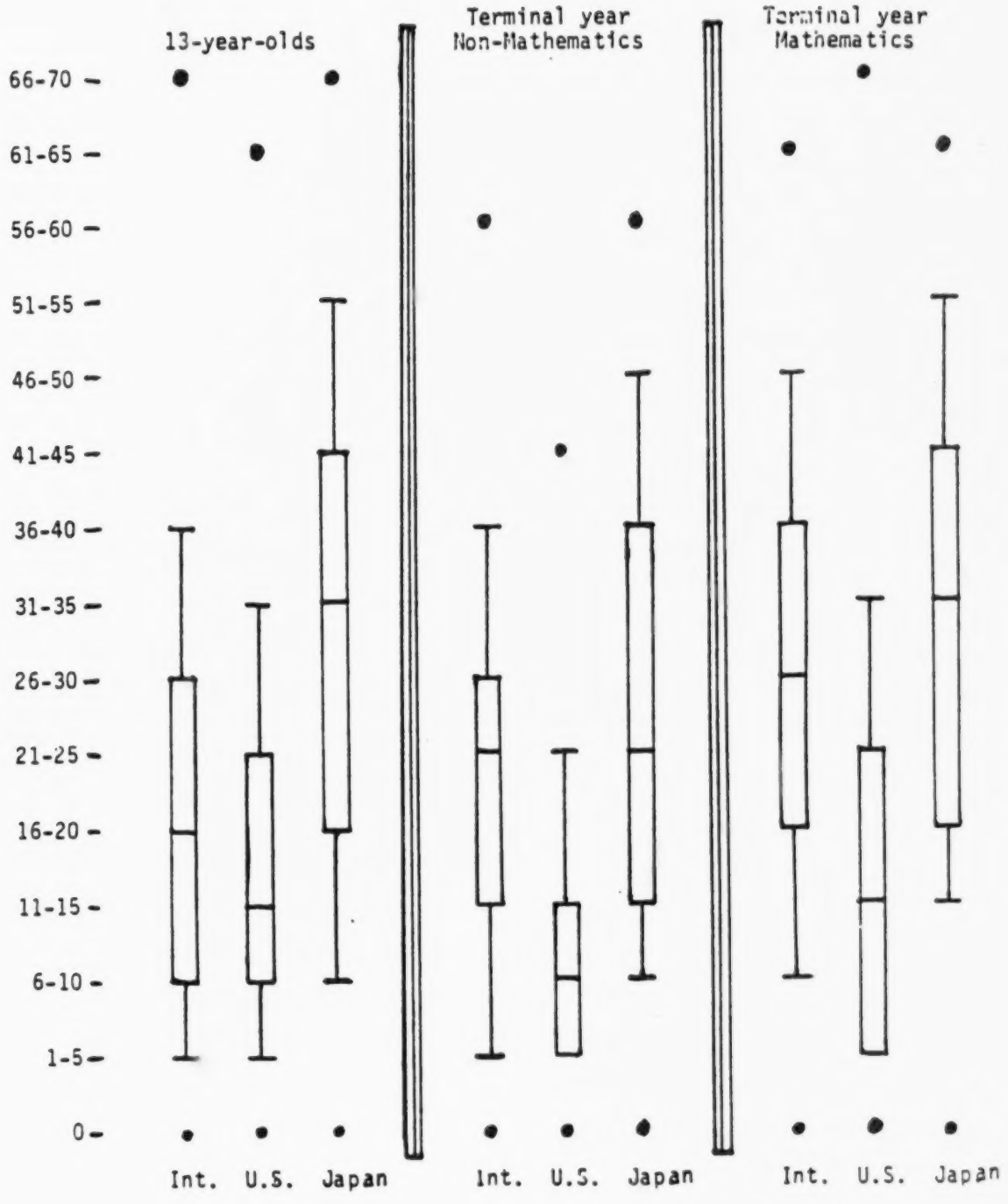

Figure 1. Approximate Box and Whisker plots of the distribution of performance in Japan, U.S. and Internationally from the First International Mathematics Study. The sources of the data are Tables 1.1, 1.3, and 1.4 from Husen (1976, Vol II, pp. 24-27). These scores have been corrected for guessing.

NOTE: The "box and whisker" plots designate the approximate 10th (bottom of lower inverted "T"), 25th (bottom of rectangle), 50th (solid line through rectangle), 75th (top of rectangle) and 90th (top of upper"T") percentiles of the score distributions. The single dots at the bottom and top of each distribution set off the full range of scores.

of these students designated as in a mathematics emphasis (at least 5 periods per week of college preparatory mathematics). Only the U.S. had a higher percentage in school (70%) and the U.S. (18%), Sweden (16%), and Australia (14%) had higher percentages of students in the mathematics specialist population (3a). Most countries retained less than 20% into the preuniversity year and 5% or less in Population 3a. According to the report, the nonmathematics student in Japan (Population 3b) typically studied mathematics 3 periods per week while students from other countries might not be studying mathematics at all in the preuniversity year.

Despite its relatively comprehensive secondary system, Japan's average performance is securely above the international grand mean for both mathematics (.38 standard deviations higher) and nonmathematics (.34 standard deviations higher) populations in the preuniversity year while U.S. students in both populations averaged almost a standard deviation below the international means. Comparing performance at various points along the distribution, Japanese students again did well. For both populations, the 10th percentile in Japan corresponds to approximately the 15th percentile internationally and the 50th percentile in the U.S. Students at the 25th percentile in Japan performed roughly as well as the 30th percentile internationally and the 75th percentile in the U.S. The performance of the more able Japanese students (top 10 or 20 percent) also compares favorably with the equivalent proportions of the student cohorts from other countries. Here, again, only about 10 percent of the

U.S. students answered as many questions correctly as the average Japanese student (50th percentile).

The picture is similar when performance is examined at the subscore level. Japanese 13-year-olds ranked first among the eleven countries in every category except Basic Arithmetic and New Mathematics (Table 3). For every subscore except New Mathematics, the average Japanese performance was at least .50 standard deviations above the grand mean across all pupils. Students from Belgium were the only ones to average within .25 standard deviations of Japan in Advanced Arithmetic, Lower Process, Word Problems, Geometry, Computational, and Algebra. U.S. students averaged a full standard deviation below the Japanese in five categories and over .50 standard deviations below everywhere except for New Mathematics.

As in the case of Total scores, the performance of both populations of Japanese students in the preuniversity year was less impressive although clearly quite solid, especially when compared with the more comprehensive U.S. system. The performance of Japan's nonmathematics students (Population 3b) is highest (relative both to other countries and to other subscores within Japan) in Advanced Arithmetic and Analysis. For every subscore except Geometry (.24), Sets (.22) (where Japan ranked 1st out of the eight countries), and Algebra (.19), their mean performance is at least .25 standard deviations above the international mean. In contrast the mean performance of the nonmathematics students in the U.S. is within 1 standard deviation of the Japanese performance only in Analysis, Analytical Geometry, and Sets.

For the mathematics students from the preuniversity year (Population 3a), the mean performance of students from several countries with more selective school systems (e.g., Belgium, England, France, Israel, The Netherlands) was often higher at the subscore level than in Japan. But here again, Japanese performance was above the international grand mean by at least .25 standard deviations except in Logic and Calculus. (This comparison may be misleading since several countries with high means had very small samples (France, Israel) for this population while several countries with low means (U.S., Australia, Scotland) had large samples.) Japanese mathematics students did best relatively in Analysis, Word Problems, and Geometry. Their mean performance was at least 1 full standard deviation higher than the U.S. mean in Analysis, Word Problems, Geometry, Lower Process, Higher Process, Computational, and Algebra. Only in the area of Logic did the average American student even come close.

Some attention was devoted to the question of sex differences in mathematics achievement in FIMS (Husen, 1967, Vol II, pp. 239-242). Using the overall standard deviation for the scores pooled across all countries as the unit for comparison, Japanese boys score consistently higher than girls for every population on both total score (Husen, 1967, Vol II,Table 5.26, p. 240) and on the Verbal and Computational subscores (Husen, 1967, Vol II, Table 5.28, p. 242). The differences were relatively highest for the nonmathematics students in the terminal secondary school year (Population 3b; .59 standard deviations on Verbal, .53 on Computational, and .39 on Total) and

relatively lowest (.17) on the Computational subscore for 13-year-olds (Population 1a). In comparison sex differences in the U.S. were much smaller for the 13-year-old and nonmathematics students, with girls actually averaging higher than boys on the Computational items at age 13. For the terminal year mathematics students, the sex difference in favor of boys was larger in the U.S. than in Japan on Verbal items (.34 vs. .27) but smaller on the Computational items (.08 vs. .25). Overall the magnitudes of their sex differences placed Japan at around the midpoint of the countries while the U.S. sex differences were smallest for 13-year-olds, near the bottom for nonmathematics students and in the middle for the terminal mathematics students.

Summary. Taken as a whole, the evidence in support of the exceptional performance of Japanese students from FIMS is quite substantial. Regardless of whether one considers average scores for countries or the entire distributions, the younger population or the older cohorts (taking selectivity into account), or various subscore categories, Japanese students exhibited high levels of achievement. Even though the performance within Japan was more variable than in most other countries, their weakest students compared favorably with those from other countries. And, in virtually every comparison with U.S. students, there was no contest. Given these results, there is little wonder that the FIMS provoked so much attention in the United States.

IEA Six Subjects Survey of Science Achievement.

The Science Achievement Study (Comber & Keeves, 1973) from the IEA Six Subjects Survey collected data on science performance

and other characteristics from students, teachers, and school officials from nineteen countries (Australia, Belgium (Flemish), Belgium (French), Chile, England, Germany, Finland, France, Hungary, India, Iran, Italy, Japan, The Netherlands, New Zealand, Scotland, Sweden, Thailand, United States). Actual data collection was carried out during 1970, typically near the end of a country's school year. The full Science Study had three main target populations: 10-year-olds (Population I), 14-year-olds (Population II) and all students in the terminal year of secondary school (Population IV). However, Japan participated only for 10-year-olds and 14-year-olds.

Description of Sampling and Measures. Sampling procedures for the IEA Science Study were generally the same as with the First International Mathematics Study. According to Comber and Keeves (1973, pp.43-50) and to Peaker (1975, pp.31-49), Japan drew a two-stage (schools, students) stratified probability sample while the U.S. selected a three-stage (districts, schools, students) stratified sample. The achieved Japanese sample was very close to the designed sample. There was no loss at all reported in the 10 year-old sample and only 2% (4 schools) in the 14-year-old sample. In contrast the match between designed and achieved sample in the U.S. was more problematic for reasons discussed by Wolf (1977; pp. 18-31). Of the designed sample, only 68% of the schools and 65% of the students in Population I and 57% of the schools and 46% of the students in Population II were achieved (Peaker, 1975, Table 2.1, p. 36).

The test administered to 10-year-olds contained 40 multiple-choice items covering topics in Earth Sciences (9 items), Biology

(13 items), Chemistry (4 items), and Physics (14 items). In later subscore reporting, the Earth Sciences and Chemistry items were combined because of the limited number of items on these topics. Subscores for four behavioral categories (Functional Information, Comprehension, Application, Higher Processes) were also reported. According to Comber and Keeves (1973, p.33 and elsewhere), most of the items administered to Population I students tested knowledge and understanding that was not likely to be the result of specific teaching but rather reflected "receptivity to the environment in general elementary learning situations".

Fourteen-year-olds were administered an 80-item multiple-choice test covering the subject areas of Biology (19 items), Chemistry (19 items), and Physics (22 items) plus a set of 20 items designed to assess (by paper and pencil) their abilities to do practical work in the laboratory or the field. These Practical items were designed to measure the ability to use simple apparatus and implement simple procedures (2 items) and the ability to select appropriate apparatus and/or procedures for a novel experimental problem (18 items). The items for this population of students were also assigned to the same four behavioral categories as the test items administered to 10-year-olds. Finally, there were 11 common items administered to the students from the two populations.

One additional feature of the tests is worth noting. The national centers from the different countries were asked to assess the suitability of the tests for measuring their country's curriculum for the study populations. Ratings of the degree of

importance of each item in a country's curriculum were obtained. These ratings were then averaged by subject area (Earth Sciences, Biology, Chemistry, Physics) and then standardized within country to yield a national curriculum profile of the country's relative emphasis on each subject area (Comber & Keeves, 1973, pp. 21-25). The results for 14-year-olds in Japan (the 10-year-old results were viewed as unusable internationally and thus not reported) place the greatest emphasis on Earth Sciences and least emphasis on Chemistry. In fact when the standard scores for each subject area are ranked across countries, Japan's relative emphasis on Earth Sciences was the second highest among the sixteen countries testing at this age level. In contrast, the U.S. emphasis at this age level was judged to be on Biology, Earth Sciences, and Physics (in that order but approximately equally) with the lowest relative emphasis on Chemistry among the participating countries. We bring this information to the reader's attention to highlight the fact that the decision to eliminate Earth Sciences from the test administered to 14-year-olds meant that its match to the Japanese curriculum at this level was presumably poor.

Results. As with the First Mathematics Study, the Science Study results can be summarized in a number of ways. In what follows, we report Japanese, U.S. and International results by total scores and subtest scores for each population. In addition, Kelly's (1978) monograph on sex differences in science, which reports on secondary analyses of these data, enables us to provide information about this possible source of differentiated achievement.

The total score results appear in Table 6. Japan's superior science performance is clearly evident. The average score for Japanese 10-year-olds is 5 points higher than the International mean and about 3.5 points higher than the next highest scoring country (Sweden). Performance was also relatively homogeneous for this age group in Japan. In contrast while the mean score for U.S. students was above the international mean, the variability of scores within the U.S. was also the highest among the participating countries.

For the 14-year-old population, Japan's mean score of 31.2 is almost 9 points higher than the international mean (about .75 standard deviations) and, with the exception of Hungary, is over 6 points higher than the mean scores from other countries. At this age level, the variability of scores within Japan is the largest among participating countries. However, given its high mean, it is reasonable to conjecture (no distribution information is provided in Comber and Keeves) that even the lowest scoring Japanese students compared favorably with those from other countries. At the upper end, Kelly (1978, Table A V.IV, p. 128) reports that the total score (corrected for guessing) obtained by the top 5% of pupils in Japan was 56.3, 12.5 points higher than the corresponding value internationally and 5 points higher than for the next highest country (Hungary). In another table (Table A V.V, p. 129), Kelly reports that 31.7% of the boys and 11.2% of girls in Japan scored above the standard defined by the top 5% internationally in terms of total test score for 14-year-olds. The corresponding figures for the U.S. were 8.2% and 2.2%.

Focussing on subtest performance (Table 7), Japanese 10-year-olds did well virtually everywhere, ranking 1st except for items classified as Informational. Relatively (to both other countries and to other subtests within the country), their performance was highest for the behavioral category Understanding (.72 standard deviations above the international mean), Biology (.64), Physics (.58), and Higher Processes (.56). In comparison, U.S. 10-year-olds were strongest relatively in Physics (.33) and Higher Processes (.23) and weakest in Biology (-.10) and Applications (-.08).

Turning to the 14-year-olds, Japanese performance was again uniformly high compared with students from other countries. They ranked 1st everywhere except on Biology and Information subtests (where Hungary had exceptionally high mean scores). Relatively, Japanese students did best on Understanding (.86 standard deviations about the international mean), Physics (.77), Higher Processes (.66), Chemistry (.62) and Applications (.55) and worst on Information (.24). The performance of U.S. 14-year-olds was poorer relatively than with the 10-year-old cohort. Their mean scores were generally at the international mean with slightly higher relative performance in Biology and lower in Physics, Practical, and Understanding.

The data on sex differences (Table 8) clearly indicate that boys scored higher than girls on all subtests in both populations in Japan and the U.S. (and in every other country for that matter). Comparing 10-year-olds with 14-year-olds, the sex

differences in performance increased with age. For 14-year-olds, these differences exceeded .50 standard deviations in Japan on the Physics and Practical subtests as well as on Total score. These were also the areas in the U.S. for which boys scored substantially higher than girls.

Clearly, there were sex differences in science achievement in Japan as there were elsewhere. What is also evident is that Japanese girls did very well in comparison with both boys and girls from other countries. At age 10, the mean scores for Japanese girls ranked them 2nd (only to Japanese boys) in Biology, Earth Sciences, and Total and 3rd (after Japan and U.S. boys) in Physics. At age 14, Japanese girls' scores ranked 4th overall in Biology, Chemistry, and Total and 5th in Physics (Note: Hungary's girls scored higher than girls from Japan in Biology and Chemistry.) They scored higher than U.S. boys on every subtest.

In virtually any other participating country, the performance of the typical Japanese girl would be viewed as exceptional. Yet in Japan, there were roughly 2 girls for every boy scoring in the bottom 20% of pupils and almost 3 boys for every girl scoring in the top 20% of pupils. Given this performance pattern, there are undoubtedly many Japanese girls whose performance would admit them to the fast track in the mathematics and sciences areas in other countries but are relegated to lower status opportunities and institutions in Japan.

Summary. The pattern of exceptional performance Japan exhibited in the IEA Science Study mirrors their earlier

performance on the First International Mathematics Study. Both overall and by subtest, both younger and older populations performed well. The phenomena of large variance as well as high mean scores occurred with the 14-year-old sample from Japan just as it did for all three samples in FIMS. Contrary to certain stereotypes, then, Japanese performance is not particularly homogeneous (at least in the lower and upper secondary years). But at the same time, in terms of absolute performance levels, the weakest Japanese students did well compared with students from other countries, and there were many more students doing exceptionally well.

There are hints in the subtest data that contradict another stereotype among Japanese students. There has been some speculation that Japanese teaching methods and schooling in general tend to emphasize memorization, perhaps to the detriment of other psychologically defined categories of cognitive knowledge. But compared with their performance on items measuring Understanding and Higher Processes, Japanese students did relatively poorly on Information items. There simply isn't evidence in this study (and from FIMS as well) to support a narrow view of the psychological emphasis of Japanese schooling and its consequences. Perhaps these notions are derived from data on younger or older Japanese students.

Finally, expectations about the disparity in performance between the sexes in Japan were supported by the Science data. But these differences were not unusually large in most cases compared with most other countries. Moreover, compared with

other countries, Japanese girls did quite well, suggesting that socialization and differential opportunities might be better explanations than differential ability for the sex differences.

In sum our reading of the two IEA sponsored studies indicate that if anything, contemporary popular accounts of exceptional Japanese performance based on IEA data understate their findings. The differences existed and they were large virtually everywhere. What these studies do not address is whether Japan's elevated performance pattern persists to the present, whether non-IEA data corraborate the results and whether Japan's superior achievement would be exhibited with younger cohorts and in other subject areas besides mathematics and science.

The Second International Mathematics Study.

Data from the IEA Second International Mathematics Study (Chang & Ruzicka, 1985; Garden, 1985; National Institute for Educational Research, 1981, 1982, 1983; Travers, 1985; Travers & McKnight, 1985; Wolfe, 1983) do address the issue of whether superior Japanese performance still persists, at least in the area of mathematics. However, two caveats are in order before examining selected data from this study. First, the Second International Mathematics Study (SIMS) was a much more complex undertaking than its IEA predecessors. The focus this time around was more clearly on issues and topics of interest to mathematics educators than had been the case with FIMS (which was more strongly influenced by comparative educators). This orientation led to an emphasis on teaching and learning in mathematics classrooms and classes become the targeted sampling units. In

addition the definition of the younger population shifted from age (13-year-olds) to grade (all students in the grade in which the modal number of students has attained the age of 13.0-13.11 years by the middle of the school year). Eventually the participating countries split into two sets: a cross-sectional group conducting a study along the lines of earlier IEA research and a longitudinal group that collected pretest and posttest data to measure growth during a year's instruction and extensive survey data from teachers on classroom processes at the early secondary level (Population A). These are only a few of the unique features of SIMS that make it a complicated study to summarize briefly.

Our second caveat has to do with the current status of the SIMS data and reports. Although data collection concluded in 1982, the cross-national data banks were not completed until recently and the embargo on release of country-identified data was not lifted until November 1985. Moreover, while reports on the national data from Japan, Canada (British Columbia) and the U.S. were all released by the beginning of 1985, most reports on the international data are still being written or are in draft form. Several reports have not been released except for the use of authors of IEA publications and are not supposed to be cited. Through Burstein's role as a member of the U.S. National Technical Committee for SIMS and as senior editor for the forthcoming volume on classroom processes and student growth in early secondary school, we do have access to these documents. Under the circumstances, however, it is necessary to be circumspect in summarizing SIMS results and reports that have not

yet been officially released. Further, the reader is cautioned that both the data to be cited and its interpretation are subject to modification in subsequent revisions of various reports.

With these caveats firmly in mind, we turn to a brief description of the design and results from SIMS. Twenty-four "countries" (Australia, Belgium (Flemish)*, Belgium (French), Canada (B.C.)*, Canada (Ontario)*, Chile, England/Wales, Finland, France*, Hong Kong, Hungary, Ireland, Israel, Ivory Coast, Japan*, Luxembourg, Netherlands, New Zealand*, Nigeria, Scotland, Swaziland, Sweden, Thailand, United States*) participated in some part of SIMS. The eight countries designated with an "*" above (including both Japan and the U.S.) conducted the longitudinal version of the study for the early secondary school population (Population A). The U.S. and Canada (British Columbia) also conducted a longitudinal study for the terminal mathematics students population (Population B, similar to Population 3a from FIMS).

It is important to note that Japan departed from the international definition in selecting their early secondary school population. They chose to test students in the 7th grade rather than the 8th grade which would have corresponded to the Population A definition. According to Travers (1985), the suitability of the content of the international test for the younger age group was a major reason for Japan's decision.

Description of Sample and Measures. Sampling procedures for SIMS (summarized in Garden (1985)) were modified from those used in earlier IEA studies to accomodate the shift in emphasis

to classroom practices. At the Population A level, the designed sample in Japan called for the selection of 220 schools stratified by community size and school size (plus a National Schools stratum; private schools and schools for handicapped were excluded) and the random selection of one 7th grade classroom from each school with all students in that classroom to be tested. The achieved sample contained 213 schools/classrooms (97%; this figure is reported in Garden (1985) although the 1981 report from National Institute for Educational Research in Japan indicates that there were only 212 schools) and 8091 students (8103 according to NIER).

At Population B schools were stratified by school type (Public, Private, National) and by the percent of students in the school who entered a university in the year prior to testing. The available information from Garden (1985) and from NIER (1981, 1982) on how schools were to be selected is not in complete agreement. According to Garden, 220 schools were selected with probability proportional to size followed by random selection of one class per school in most cases with an achieved sample of 207 schools and classes (93%; 7,954 students). NIER (1982, Tables 3.2-3.3 as translated by Ishizaka) reports the same number of classes and students but a different number of schools (192). We are unable to clarify what actually happened at this point. Various reports also disagree slightly in the proportion of Japan's age cohort contained in Population B. The reported figures range from 12 to 15%.

The designed and achieved samples in the U.S. were somewhat different from those in Japan. At the Population A level (Grade

8), the only schools and classes excluded from the population were those for students with disabilities. Strata were defined by region, public/private, and by SMSA location. The national probability sample of schools were selected in two stages (districts, then schools within districts with probability proportional to grade 8 enrollment) for public schools and a single stage for private schools. Within schools two intact classrooms were selected with equal probability from content-ability substrata. Because problems were anticipated in obtaining cooperation at the district level, districts were over sampled. Essentially the same strategy was used to select classrooms for Population B.

Response rates in the U.S. were somewhat problematic (Bock & Spencer, 1985; Garden, 1985; Travers, 1985). Only 50% of the Population A and 48% of Population B districts agreed to cooperate. At the school level cooperation rates were 69% and 75% in public schools and 38% and 43% for private schools. At the class level, however, the response rates were reasonably high (82% for Population A Public, 84% Population B Public, 90% Population A Private, 76% Population B Private). The final achieved samples contained 280 classes (only 236 conducted the complete longitudinal study at this level) and 6784 students at Population A and 252 classes (236 were longitudinal) and 4631 students. Finally, the definition of Population B in the U.S. meant that only about 10-12% of the age cohort was included. So that although Japan reportedly maintains a higher percentage of its age cohort in the terminal year of schooling (92% vs. 85% for the

U.S.), their proportions in the population are essentially the same.

The basic design for testing at Population A was to have all students complete a core test of 40 items designed to represent the main content categories (Arithmetic (Fractions, Ratio, Proportion and Percent), Algebra, Geometry, Measurement, and Statistics) of the international grid and one out of four alternate forms of 34 items distributed in rotation within the classroom by the teacher. Students participating in the longitudinal version of the study would not necessarily take the same rotated form on both occasions. Because Japan conducted their pretesting in mid-May 1980 (the beginning of their school year; U.S. pretesting occurred during the fall of 1981), at a time prior to the availability of the final versions of the longitudinal tests, they administered a special 60-item pretest. The Japanese also chose to eliminate certain items from the tests they administered at the posttest and administered a few items unique to their country. There were also a few other differences between the versions of the tests administered in cross-sectional vs. longitudinal countries. As a result, there are only 157 items common to the participating longitudinal countries for Population A. Our observations will be limited to this set of items. Approximately 36 of these items were also administered as part of the First International Mathematics Study.

The test for Population B contained 136 items distributed across 8 content areas (Sets and Relations, Number Systems, Algebra, Geometry, Elementary Functions/Calculus, Probability and

Statistics, and Finite Mathematics). Test items were assembled into 8 forms containing 17 items each and each student was assigned two test forms randomly. Eighteen items administered to Population 3a students during the First Mathematics Study were re-administered to Population B students as part of SIMS.

In the design of the tests and in many of the reports currently available, the test items have been packaged into a number of more specific content-focussed subtests and into the behavioral categories of Computation, Comprehension, Application and Analysis. Where possible we will present available evidence at this finer level of detail.

Results. Because not all students were asked to answer every item, most of the SIMS results have been presented in terms of the percentage of students answering individual items correctly or as subtests derived from the average of the percentage correct on the items contained in the subtest. Moreover, since most reports are still in draft form, reported statistics from one source do not always coincide with those from another. However, there have been no instances in which patterns and interpretations would differ depending on the source selected.

Taken as a set, the evidence from SIMS seems to reinforce earlier findings: Japanese students do very well in mathematics. For example table 9 reports the average percentage of correct responses on the posttest by the major content topics at both populations. On every subtest, Japanese students are at least 10 percentage points above the international mean (the average of

the unweighted country averages at the subtest level) and the corresponding values in the U.S.; this translates into 10% more correct responses across the full range of content tested.

In a refined subscore breakdown that is to appear as part of the cross-sectional volume on SIMS (Garden, Robitaille et al.,in process), Japan ranked 1st out of 20 participating countries on 14 of 18 subscores (they were 2nd on Whole Numbers (to France), Non-Computational Arithmetic (to the Netherlands) and Word Problems (also to the Netherlands) but 6th on Standard Units of Measurement (behind Belgium (Flemish), Belgium (French), France, Hungary, and The Netherlands)) at Population A. At Population B Japan ranked 2nd (to Hong Kong) out of 15 countries on all 17 subscores except Equations and Inequations (where they ranked 1st). In this same volume, they report that 45% of the Japanese students exceeded 75% correct responses on the 40-item core test given to all students at Population A; in comparison only 17% of the U.S. students had scores this high. On the 8 17-item test forms administered at Population B, over 48% of Japanese students had average form scores exceeding 76% (at least 13 correct responses) while less than 3% of U.S. students had scores this high.

Wolfe's (1983) report on the processing of the longitudinal data files from SIMS provides item-by-item percentages of correct, incorrect, and omits on the pretest and posttest for all 8 countries participating in the longitudinal study for the early secondary school population (A). The item results were also clustered into 36 more detailed content categories based on the international grid.

The distribution of the percentages of correct responses (p-values) at posttest to all 158 items administered by both Japan and the U.S. is presented in Figure 2. There are marked differences in the two distributions. In Japan, there was 34 items with p-values of .80 or greater and only 11 items with p-values less than .30. In contrast, there were only 7 items with p-values greater than .80 and 30 items with p-values below .30 in the U.S. The significance of these choices of cutoffs is that .80 represents the upper end of the typical standards for mastery used in competency and proficiency testing in the U.S. while values below .30 approach the classical interpretation of a chance score (i.e., randomly guessing on a 5-choice test item would be expected to yield a p-value around .20).

We tabulated for each of the five main content topics the number of items for which Japan's p-value exceeded the U.S. p-value by at least .05, the number with the U.S. higher by .05 and the number where the differences were less than .05. The Japanese p-values was at least .05 higher on 31 out of 46 Arithmetic items, 25 of 30 Algebra items, 30 of 40 Geometry items, 22 of 24 Measurement items and 13 of 18 Statistics items. U.S. p-values were at least .05 higher on 11 Arithmetic, 2 Algebra, 5 Geometry, 1 Measurement and 3 Statistics items.

These data also allow us to address the question of the change in Japanese performance for Population A students during a single year's instruction and how it compares to U.S. results. The average percentage correct for the posttest plus the average change

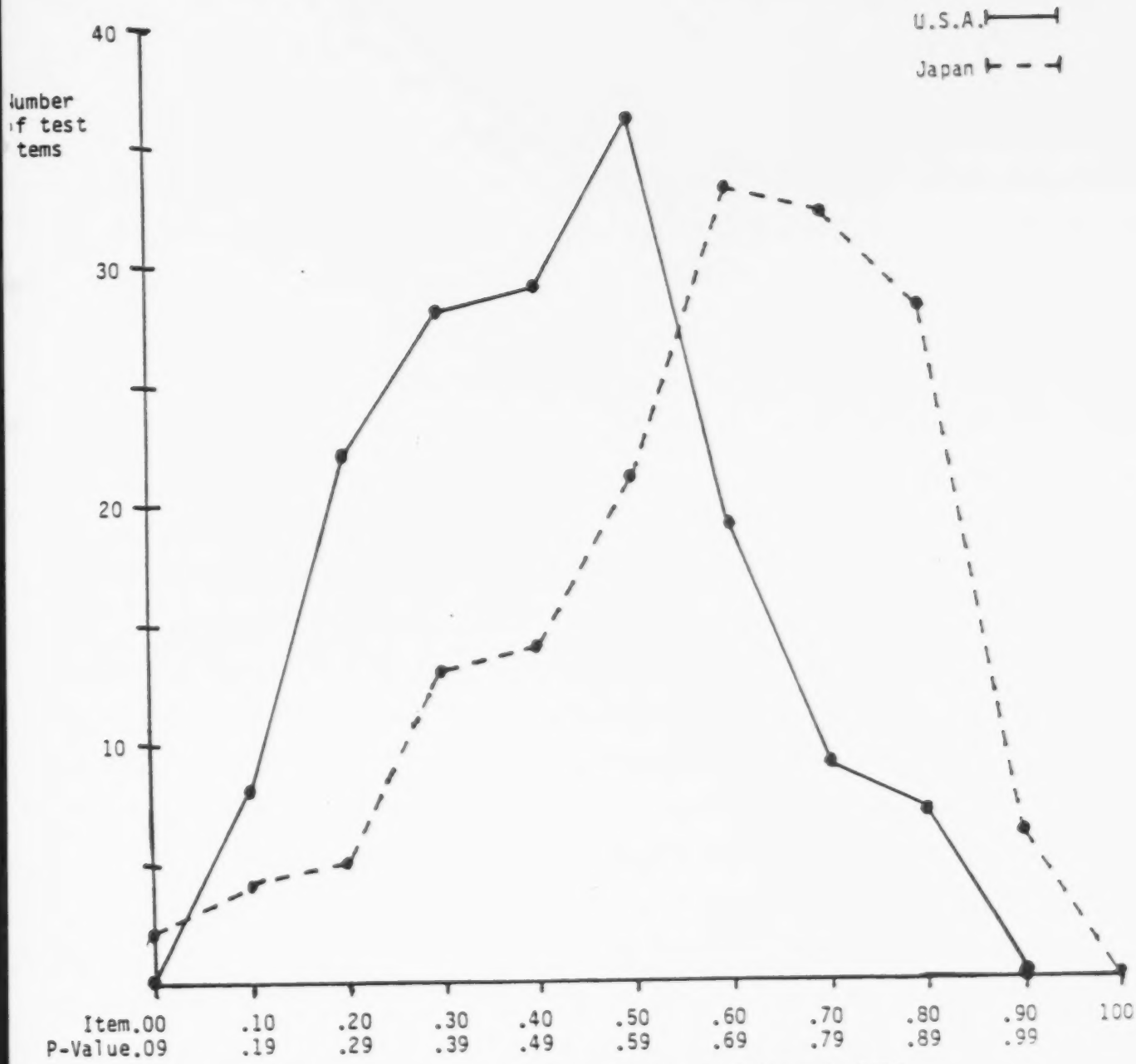

Figure 2. Distribution of posttest percent correct 8th grade SIMS.

in percentage correct from pretest to posttest (gain) for the 36 subscores for Japan and the U.S. are presented in Table 10.

On most topics in the areas of Arithmetic, Measurement and Statistics, Japan started the year higher than the U.S. and their performance changed very little. The large changes in Japanese performance occur in Algebra and, to some extent, in Geometry. From other SIMS reports (Schmidt & Burstein, 1985), we know that at the beginning of the year, Japan and U.S. students performed equally well in Algebra but Japan had the largest changes by far on this topic among the 8 countries participating in the longitudinal study. The corresponding U.S. changes in Algebra and Geometry are more modest which would be expected since a substantial proportion of the U.S. teachers spent little time on these topics.

Clearly, the Japanese students exhibited significant gains on topics that were emphasized during the school year (7th grade). The instructional emphasis for 8th grade students in the U.S. was more heterogeneous across classrooms (and types of classrooms) and the gains more modest overall. Whether these U.S. gains represent large gains for students in some classes covering the specific subjects and little or no gain elsewhere is unclear from these data.

Next we consider the change in performance between FIMS and SIMS. There were 36 common items at Population A and 19 items at Population B. The results by various content topics and selected other subscores are reported in Tables 11 and 12. Overall, Japanese performance at Population A stayed the same with increases in Algebra and Computation and decreases in Arithmetic, Statistics, Applications, and Word Problems. At Population B there were

improvements everywhere, especially so on the Sets and Relations item (which was essentially New Mathematics at the time of the FIMS), the Probability and Statistics items and the Elementary Functions/Calculus items. The data provided by the NIER report indicate that the improvement occurred on items from all behavioral categories; comparatively, changes were smallest for Word Problems although performance was very high already on such problems.

In contrast the U.S. lost ground overall at Population A with largest drops in Arithmetic and Geometry and for higher levels of the behavioral categories. Improvements at the 12th grade (Population B) occurred primarily on the Sets and Relations item and on the Elementary Functions/Calculus items. However, it is difficult to interpret the significance of the Population B trends for the U.S. given the drop in the proportion of the age cohort enrolled in college preparatory mathematics since FIMS.

The evidence regarding gender differences in mathematics performance on SIMS tests has only recently emerged in a comparative frame of reference. The 1982 NIER report on Japan presented descriptive statistics separately by sex for each test form but no breakdown by content. At the Population A level, sex differences in the average number correct responses were inconsequential (NIER, Volume II, Table 4.3; less than 1 point on tests of length 40 and 34 with form standard deviations ranging from 5.45 to 7.94); boys scores were slightly more variable on each test. On all 8 test forms at Population B, boys scored significantly higher than girls (NIER, Volume II, Table 4.4). Accompanying figures (Figures 4.1 & 4.2) in that volume

depicting the distributions of correct responses from the core test at Population A and form 1 at Population B, show essentially the same negatively skewed score distribution for the former while for the latter, the boys' distribution was highly negatively skewed and the girls' scores had the same mode but a relatively uniform distribution for the broad middle range of possible scores.

Draft materials from the SIMS Cross-sectional Volume (Volume II, with Garden as Senior editor) elaborate but do not contradict these gender results for Japanese. Reporting 16 separate subtest scores at Population A, the only gender differences larger than 3 percent favored Japanese boys on Transformation Geometry, Statistics, and Standard Units of Measurement. As suggested by the NIER report results, gender differences are more widespread at the Population B level with boys' mean scores exceeding the girls' by at least 4 percent on subtests on Number Systems (all items as well as Real Numbers), Higher Level Algebra, Geometry (all items and both Analytical Geometry and Trigonometry), Analysis (all items and both Elementary Functions and Calculus) and Probability and Statistics. Apparently, gender differences in mathematics performance are an evolving phenomenon as one progresses through Japanese secondary schools. (In the draft of the SIMS Cross-sectional volume, gender differences in the U.S. were more mixed at Population A, some favoring girls, while they favored boys consistently at Population B, but the differences were typically smaller than in Japan. These results coincide reasonably well with the U.S. Summary Report.)

There were certain limited demographic comparisons of mathematics performance provided in NIER's National Summary Report. At Population A, (Table 4.5 from NIER, 1982, Volume II), the mean number of correct responses (for students and schools) on the core test (40 items common to all students) ranged between 26.1 and 27.6 for the four regional classifications (medium sized cities highest, towns and villages lowest). The larger schools (1000 or more students) had the highest average scores (27.4 compared with 27.1 for medium and 25.6 for small schools). Students from the two National schools in the SIMS sample averaged 34.8 correct responses, considerably higher than 26.8 average for all Public schools (Private schools were not sampled in Japan at this level).

The only demographic results for Population B in Japan are contained in Table 4.6 of the NIER report (1982, Volume II) and are based only on data from the first 17-item test form. Students from the two sampled National schools (only 16 students) average 13.5, 2 points higher than Public school students and 3.3 points higher than students from Private schools. As might be expected, mathematics performance was strongly related to the proportion of a school's students going on to higher education with 4.4 points (13.4 vs. 9.0) separating schools with more than 65% going on to college from those with less than 35%.

Summary. We have discussed the results from SIMS at great length yet barely scratched the surface. The evidence suggests that:

- In terms of absolute levels, Japan's exceptional performance in mathematics (and presumably science) has persisted through the period spanned by the IEA studies (basically

1964-1982). Its students do well essentially across the board.

- In terms of a single year of instruction, Japanese students exhibit substantial growth on topics emphasized in the curriculum.

- The trend in performance from FIMS to SIMS is decidedly positive for students in the final year of secondary school but more mixed at the Population A level (7th grade). On the other hand, this cohort was probably a year younger in SIMS than the Population 1a students from FIMS.

- Gender differences in performance are generally inconsequential at Population A but markedly favor boys at Population B.

- As in virtually every country, demographic differences in performances do occur. Certain of these differences (region, academic orientation of the school) are fairly standard while others (National Schools, comparatively poor Private schools' scores) are consequences unique to the Japanese educational milieau.

Beneath the surface results are intriguing glimmers of some special attributes of the Japanese system. The NIER reports are full of tables that examine performance from a variety of angles, sometimes in microscopic detail. A few examples serve to illustrate our point.

- A set of tables (1.8 and 1.9 from Volume I) contain all items for which Japanese students averaged greater than 80% correct responses along with corresponding teacher and student opportunity-to-learn (OTL) data (broken down by taught this year or before). These high performance items come from all the major content areas, and for virtually every item, both teachers and students report high OTL with much of the learning in areas other than Algebra and Geometry occurring in prior years. The commonalities among these items that might account for high performance are evidently not their emphasis on computational material. Rather, most of these items appear to represent concepts that involve teachable algorithms and rules, whether verbally or nonverbally presented. Symbolic versus pictorial or graphical presentations seem not to matter nor does the number of steps entailed in applying the algorithm. Apparently, if Japanese students have been taught how to approach a specific type of problem, most learn how to solve it.

- Similar information is provided for items that were relatively difficult for Japanese students (Tables 1.10 and 1.11 of NIER Volume I). It is evident from these tables that Japanese students were not taught all the topics covered by the Population A tests by this point in their schooling. Where there is clear indications of little OTL (e.g., Square Roots, Pythagorean Theorem, Transformational Geometry), performance is low. Japanese students don't know everything apparently.

- In another set of tables (Tables 1.14-1.16), items with large differences between student performance and teachers' estimates of the percent correct responses of their students are listed. There were a large number of items for which teachers underestimated performance for both populations. However, there were only four items where teachers substantially overestimated performance.

- From an American perspective, it is remarkable that the Japanese were able to stratify secondary schools by the proportion going on to the university the previous year. The typical American high school has only spotty information regarding the whereabouts of its graduates.

- The limited text provided in the English translation of the Japanese Summary Report expresses some concerns with student performance in Geometry and for higher-level processes. There is also some concern that performance levels for verbal items might be lagging behind those for computational items.

One comes away from the Japanese report with a perception of detailed self-criticism in the pursuit of shoring up weak spots. Whether this is simply a matter of style or the reflection of sincere concerns that mathematics training might be deteriorating in some way cannot be ascertained from the materials in hand. One would think, however, that this type of introspective inquiry into status and progress helps to maintain what by international standards is a highly effective educational system in the area of mathematics.

What is clear from all that we have read on Japan is that the quality of mathematics and science training is a continuing focus of the Japanese educational system. In our search for

materials for this report, we found reports on a 1956 nationwide survey of mathematics achievement (Ministry of Education, 1958) and a 1957 nationwide survey of science achievement (Ministry of Education, 1959). The significance of these reports has to do with their dates. Both precede the American awakening of concern for mathematical and scientific training fostered by Sputnik. The surveys also predate the IEA studies as well as the origination of the American national assessment program. Given Japan's preeminence on international studies, one might do well to mirror their continuing introspection.

The Harnisch-Sato Study of High School Mathematics

As we pointed out earlier, most of the evidence on the performance of Japanese students at the secondary level has been derived from the IEA studies. Recently, however, mathematics performance data were collected from students in Japan and in the state of Illinois as part of a collaborative study between Nippon Electric Company (NEC; Takahiro Sato) and the University of Illinois (Delwyn Harnisch) that tend to corroborate the IEA findings. The results of the Harnisch and Sato study are reported in Harnisch and Sato (1983), Harnisch and Ryan (1985), Harnisch, Walberg, Tsai, Sato, and Fyans (in press), and in the 1985 Illinois State Board of Education report entitled Student Achievement in Illinois: An Analysis of Student Progress (ISBE,1985).

According to these reports, NEC selected a nationally representative sample 1700 students from public and private schools. The U.S. sample of 9,582 students was selected randomly

from school districts throughout the State of Illinois as part of The Mathematics Decade Study conducted under the auspices of the Illinois State Department of Education. According to the ISBE report (p. 11), all students sampled were enrolled in the 11th grade. Harnisch and Sato (1983) states that samples of 16-year-olds were drawn. The remaining reports are unclear with respect to the specifics of the sample definition. The age distributions contained in all except the ISBE report support either definition for the U.S. sample. The Japanese distribution is suspicious, however, with a reported 27% 15-year-olds, 36% 16-year-olds, and 37% 17 or older. Presumably some other basis was used than single age or single grade sampling.

Students in both countries were administered the High School Mathematics test designed by ETS during the spring of 1982. The mathematics test consisted of 60 items on such topics as algebra, geometry, modern mathematics, data interpretation, and probability. Student attributions of success and failure on test-taking activities and a background questionnaire containing a set of common questions (student sex, age, discussion of school with parents, frequency of reading additional books, self evaluation of reading, level of mathematics courses taken, and expected mathematics performance) were also collected.

The achievement results are reported only for the total mathematics scores. In some reports performance is broken down by age levels and by the number items answered correctly by the top 1, 5, 10, 25, 50, and 75 percent of the relevant age groups. Overall, Japanese students averaged 39.6 items correct, roughly double the number of correct for Illinois students. When these

performance differences are examined broken down by selected variables taken from the background questionnaires (Harnisch & Sato, 1983, Table 1, p. 179; Harnisch et al., in press, Table 1), other patterns emerge.

- The gap between Japanese and U.S. performance increased with age, going from less than 18 points for 15-year-olds to more than 26 points for the 17 and older cohort.
- For all three age groups, performance differences were greatest at the low end of the score distributions (25th percentile) and least for the top 1 percent of the age cohorts (ISBE, 1985, Figure 2.3,p.12)
- Japanese males averaged almost 6 more items correct than females while the gender difference in mean scores for the U.S. was less than 1 point.
- Students who claimed that they read additional books just about every day in Japan averaged more than 5 points higher than students who hardly read additional books at all. In the U.S. the difference between these two groups was less than 2 points. In contrast, reading self-evaluations yielded larger differences in the U.S. than in Japan.

We would have liked to know more about the students sampled in Japan and about performance differences on more refined content classifications as in the IEA studies. Nevertheless, there is nothing in the results from the Harnisch-Sato study that contradicts the general pattern of a substantial Japanese performance advantage found in the IEA studies.

Stevenson et. al.

With the single exception of the IEA Science data for 10-year-olds, all the results so far have been for secondary school students. The most extensive comparative study of achievement differences between Japan and the U.S. during the elementary school years has been conducted by Harold Stevenson and his colleagues and collaborators from Japan and Taiwan. Their study

was conducted in 1979-81 on samples of students from kindergarten, 1st and 5th grade classrooms in presumably comparable cities in Japan (Sendai), Taiwan (Taipei), and the U.S. (Minneapolis). The major references for this study are Stevenson, Stigler, Lucker, and Lee (1982), Stigler, Lee, Lucker, and Stevenson (1982), Stevenson, Lee, Stigler, and Lucker (1984), Stevenson, Stigler,Lee, Lucker, Kitamura, and Hsu (1985), Stevenson, Lee, and Stigler (in press), and Stevenson, Stigler, Lucker, Lee, Hsu, and Kitamura (in press). In our discussion we will focus on the Japanese and U.S. results.

Description of Sample and Measures.According to Stevenson, Lee, and Stigler (in press), the decision to sample a single city in each country was dictated by funding constraints. Minneapolis was chosen because its residents were primarily native-born, English-speaking, and non-minority with generally sound economic circumstances. While these characteristics tend to make Minneapolis unrepresentative of typical conditions in other U.S. cities, the choice did increase the likelihood of socio-demographic and ethnic comparability to Japanese and Taiwanese locales. The city of Sendai, the Japanese study site, was judged by Stevenson and his colleagues to have a comparable status (economically, ethnically, culturally) within Japan to Minneapolis's position in the United States.

In Japan a stratified random sample of 10 schools was selected to represent the public and private schools of Sendai. Within each school, two classes were selected at random at the 1st and 5th grades. The 40 classrooms selected for the

Minneapolis sample were drawn from 13 schools. All schools were public in the Sendai sample while one private school was chosen in Minneapolis. All children in the sampled classrooms in Japan (775 at the 5th grade; the number in the 1st grade not provided) were given an individualized reading test. Children identified by the teacher or the test examiner as exhibiting low intelligence were administered the Raven's Progressive Matrices Test. All those with scores comparable to an IQ below 70 were eliminated from the sample (a total of 5 students at the 5th grade). In Minneapolis 453 fifth children were given the reading test; another 39 were excluded because lack of parental permission to participate in the study. Children judged to be mentally retarded by a school psychologist were also excluded. In both countries samples of approximately 240 students (2 boys and 2 girls chosen at random from the upper, middle, and lower thirds of the reading score distribution in each classroom) at each grade level were selected for more extensive testing, parental interviews, and classroom observation.

Although there is no mention in any of the earlier articles about the study, Stevenson, Lee, and Stigler (in press) present results from samples of children from 24 kindergarten classrooms in each country (288 children). All the Japanese kindergartens are privately owned; the sampled kindergartens were those attended most frequently by the children from the 10 elementary schools in the study sample. The Minneapolis kindergarten classrooms were selected to be representative of the entire metropolitan area.

The difficulty in finding test instruments that are fair and valid across cultures led the Stevenson et al. team to devote considerable efforts to constructing their own cognitive measures. Detailed descriptions of test development are provided in Stevenson et al. (1982,pp.1166-1171) for the cognitive ability tasks and reading tests and in Stigler et al. (1982) for the mathematics tests. The ten cognitive tasks (Coding, Spatial Relations, Perceptual Speed, Auditory Memory, Serial Memory for Words, Serial Memory for Numbers, Verbal-Spatial Representation, Verbal Memory, Vocabulary, and General Information) constructed were "selected on the basis of hypothesized differential relation to reading ability in the three languages or ... prior research in which similar tasks have been found to be related to reading ability" (Stevenson et al.,1982, p. 1170). The test battery included a mixture of verbal and performance tasks. This focus in developing the cognitive task battery was consonant with Stevenson et al.'s primary intent of gathering evidence on the incidence and prevalence of reading disabilities in Japan compared with the U.S. At certain points, the average performance on the cognitive tasks was also used as a general index of the child's level of functioning.

The reading test was designed to include seven levels (kindergarten, grades 1-5 and 6-adult) with three subtest scores (Sight Reading of Vocabulary, Reading of Textual Material, Comprehension of Textual Material) at each level. The kindergarten items involved matching, naming, and identifying letters in English and hiragana in Japanese. The Vocabulary test, designed to assess ability to sight-read single isolated

words, contained the same words in all languages for grades 1-3 and different words at the other grade levels with the constraint that comparable words were first introduced at the same grade level and had similar frequency of usage. The Reading and Comprehension subtests included items that were (a) phrases or sentences describing one of three pictures, (b) sentences with omitted key words, and (c) paragraphs about which questions were asked. Although complete comparability could not be assured, the team of bilingual researchers constructed the tests after analyzing school texts to determine when vocabulary words and characters, and grammatical structures first appeared,and selected stories based on summaries of all stories appearing the countries' texts.

The construction of the mathematics test was carried out with similar attention to curricular details. A curriculum analysis of a complete elementary textbook series was undertaken to ascertain the concepts and skills presented and the grade level and semester in which they were introduced in each country. Of the 320 topics identified, 226 (71%) appeared in both the Japanese and U.S. curriculum, 66 (21%) appeared in Japan but not in the U.S., and 23 (7%) appeared in the U.S. but not in Japan. However, these figures understate the differences in the curriculum across countries. Japan typically introduced topics earlier (68% of the topics were introduced first in Japan; 28% first in the U.S.). Moreover, Japan's curriculum included a number of advanced mathematical concepts (especially in the areas of correspondence of geometrical figures, geometry in three

dimensions, and statistical concepts) not covered in the U.S. curriculum. The final Mathematics test was designed to span the grade levels and depend primarily on topics found in the curriculum of all three countries (1 item did not appear in the Japan series and 4 items did not appear in the American series). When the semester in which items were introduced in a given country was averaged across all 70 items, the average grade level in Japan was 2.85 versus 3.26 in the U.S., roughly a half year earlier.

Results. Stevenson and his colleagues have conducted an extensive variety of detailed analyses of their data. Primary analyses are reported in Stevenson et al. (1982, 1985) and in Stigler et al. (1982). Their most recent papers (in press) summarize their achievement test findings and relate them to information gathered through parental interviews and classroom observations. We summarize their overall results below and highlight findings pertinent to the questions raised at the beginning of our discussion of cognitive characteristics.

Differences in the average performance between Japanese and U.S. students on all cognitive measures at grades 1 and 5 are reported in Table 13. The units of comparison are the differences in the means between the two countries divided by the standard deviation of scores in the U.S. (In their summaries, Stevenson et al. (in press) use z-scores derived from the mean and standard deviations of scores pooled across countries. In some cases, data are also pooled across grade levels.)

The most obvious result from the table is that with the exception of mathematics achievement, the performance differences

between Japan and the U.S. do not favor Japan. In fact Japanese students outperformed U.S. students on only 3 of the 10 cognitive tasks at grade 1 and only 5 at grade 5. On the Coding, Serial Memory, Verbal Memory and Vocabulary tasks, U.S. students score higher at both grades; the Japanese students do consistently better only on the Spatial Relations and Auditory Memory tasks. U.S. students also perform better on the Vocabulary portion of the Reading test at both grades while performance differences in the other areas were negligible. (Taiwanese scores were lower on some cognitive tasks and higher on others. Their Reading scores were the highest among countries and their Mathematics scores were more similar to Japan's than the U.S.'s).

There are several other sets of results that contribute to the general dialogue regarding the cognitive characteristics of Japanese students. This evidence can be summarized as follows:

1. Contrary to the results from Makita's (1968) teacher survey, Stevenson et al.'s data (1982) offers little support for the hypothesis that reading disabilities are less prevalent in Japan than in the U.S. At the 5th grade level, 8% of the Japanese students and 3% of the American students fell more than 2 grades behind in their reading level. Using a combined criteria of falling in the lowest 10% of the distribution of reading scores and having average cognitive task scores more than 1 standard deviation below the mean, 5.4% of the Japanese students and 6.3% of the U.S. students would be classified as reading disabled using both Verbal and Performance tasks. The corresponding figures when only Verbal tasks are used were 8.3% and 7.9% while the figures for Performance tasks only were 6.3% and 7.1%.

2. Contrary to Lynn's (1982) assertion of the cognitive superiority of Japanese children to American children, Stevenson et al. (1985, in press) found no overall differences in total scores on the cognitive ability tasks. If anything the results somewhat favored the U.S. at kindergarten and first grade.

3. The superior mathematics performance of Japanese students found in other studies occurred here as well (Stevenson, Lee, & Stigler, in press; Stigler et al., 1982). The differences between Japan and the U.S. were similar for kindergarten and 1st grade but increased dramatically by grade 5. According to Stevenson et al., of the top 100 scores at grade 1, 15 were American while there was only 1 American child in the top 100 at grade 5. Among the lowest 100 scores at each grade, there were 58 American children at grade 1 and 67 at grade 5. (Corresponding figures for Japan are not reported.) Differences at the classroom level were also substantial. The lowest scoring Japanese class at the 1st grade fell at about the midpoint of the distribution for U.S. classrooms; at the 5th grade, the lowest scoring Japanese class performed better than the highest scoring American class. These patterns held up when individual items (or items classified by computation versus story problems) were examined.

Summary. The results from the study conducted by Stevenson and his colleagues challenge assertions that Japanese performance is substantially higher than in the U.S. on virtually all measures of cognitive functioning. Here, again, we find Japanese strength in mathematics (along with evidence of broader, greater, and earlier coverage of mathematical concepts and skills). But the data regarding cognitive abilities and reading performance is more balanced, with a slight advantage to the U.S. overall. The inclusion of Taiwanese results raises additional questions about the generalizability of Japanese superiority across cognitive measures.

Whether the absence of broad-based performance differences accurately reflects population differences between countries is hard to determine. The U.S. sample certainly underrepresents the ethnic, social, cultural, and regional diversity of the country, most likely in ways that would raise American performance levels. At the same time, the Japanese and U.S. samples in this study are probably more comparable than those used in the IEA surveys;

comparisons between countries are more likely to be based on children coming from comparable home circumstances. Overall sampling limitations suggest that the U.S. figures might underestimate the prevalence of reading disabilities and overestimate its reading and mathematics achievement; the biases introduced by the sample selection in Japan are less clear but presumably are along the same lines.

The other major limitation of this study holds for any attempt at cross-cultural comparisons. The transferability of cognitive tasks across cultures is difficult at best. Consensus is that the transfer is easiest in the area of mathematics, where Japanese students shine, and most difficult in the area of reading. The limitations in the mathematics tests constructed by Stevenson et al. have to do with their relevance to each country's curriculum; the problem was less severe in Japan because its students were taught more topics earlier (and apparently better). Possible problems with the interpretability of the cognitive ability tasks results have to do with their comparative familiarity across cultures; American students are likely to have prior familiarity with similar tasks while Japanese students typically are not administered such tests. The difficulties in constructing comparable reading measures are thoroughly documented by Stevenson et al. (1982). The methods they employed reflect the state of the art and the psychometric properties of the resulting instruments are generally quite good. Moreover, there is no evidence to suggest that the reading measures were less fair in Japan than in the U.S.

In sum, then, the evidence presented by Stevenson and his colleagues challenges some notions about Japanese performance (lower incidence of reading disabilities, higher levels of cognitive functioning) and reinforces others (superior mathematics performance). While their samples were not nationally representative and their test tasks may have suffered from inherent limitations in cross-cultural transferability, Stevenson and his colleagues do provide results that cast doubts on the universality of exceptional Japanese performance.

Hess, Azuma et al.

As mentioned earlier, the collaboration of Robert Hess and Hiroshi Azuma in parallel studies of cognitive socialization and development represents the only major comparative longitudinal data base besides the IEA SIMS study. In addition, this study is the only source of cognitive data from the elementary school years outside of the Stevenson et al. study and the IEA Science data and the only source we have found with preschool data from both Japan and the U.S. Data collection for the study started with children age 3 years 8 months in 1972 and continued through age 11 in Japan and age 12 in the U.S. Papers reporting data from the study include Dickson, Hess, Miyake, and Azuma (1979); Hess, Kashiwagi, Azuma, Price, and Dickson (1980); Conroy, Hess, Azuma, and Kashiwagi (1980); Kashiwagi, Azuma, and Miyake (1982); Hess, Azuma, Holloway, Kashiwagi, Wenegrat, and Miyake (1983); Kashiwagi, Azuma, Miyake, Nagano, Hess, and Holloway (1984); Hess, Azuma, Kashiwagi, Dickson, Nagano, Holloway, Miyake, Price, Hatano, and McDevitt (1985); Holloway, Kashiwagi, Hess, and Azuma

(undated); and Hess, Azuma, Holloway, Kashiwagi, and Wenegrat (undated). Given the project's primary focus on influences in cognitive socialization, many of these reports deal primarily with family influences on children's behaviors rather than the cognitive characteristics of the children per se. Here we review only the available evidence on cognitive performance and development, leaving other material to be discussed in later sections.

Description of Sample and Measures. Hess, Azuma, and their colleagues gathered primarily cognitive ability and developmental data collected in a comparable way although not always using the same instruments. Their study samples were quite small, consisting initially of 58 Japanese and 67 American mother-child pairs starting when the children were approximately 3 years and 8 months of age. All American children were Caucasian and were initially recruited from preschools and day care centers in the San Francisco Bay area. The locales from which the Japanese families were selected were the Tokyo metropolitan area (43 families) and the city of Sapporo (15 families) (Hess et al. 1980). At the initial testing period, the families from Japan and the U.S. were roughly comparable in socioeconomic characteristics (According to Hess et al. (1983), the U.S. sample had 20 low SES, 28 middle SES and 19 high SES families while the corresponding breakdown in Japan was 20, 19, and 19.). There were 14 single-parent families in the U.S. compared with only 5 in Japan (Hess et al.,1980); the children were equally divided by sex.

The study had two rounds of data collection. During the initial round (conducted during the period 1972-1977), interview, observation and cognitive task data were gathered from parents and children when the children were ages 3 years 8 months old, 4, 5, and 6. At the follow-up phase (involving 47 American and 44 Japanese families), Japanese children were age 11 and American children age 12. According to several of the reports, the follow-up sample showed little differences from the initial group.

The measures used at various points during the study shifted from a focus on cognitive functioning in early years (ages 3 years 8 months and 4) to school readiness and IQ scores at ages 5 and 6 to achievement ratings, IQ (Japan only) and scholastic achievement (U.S. only) in the follow-up study. The real significance of the designation of this study as collaborative/parallel rather than comparative is evident from the differences in test instruments between Japan and the U.S. (Parental interviews and measures of maternal and child behavior were more likely to be the same across countries). At age 3 years 8 months, both countries used the same Concept Familiarity Index (CFI) but the Japanese used a specially developed test designed to be comparable to the Peabody Picture Vocabulary Test (PPVT) used in the U.S. At age 4 the cognitive tasks were the same across countries: a Block Sorting Task where the mother asks the child to sort a set of blocks and then provide a verbal explanation of the principle on which they were sorted and a Referential Communication Game involving mother and child where the object is for one person to describe one of four pictures on

a display in sufficient detail for his/her partner to accurately choose the figure described (both mothers and children took turns as "senders"). The school readiness measures at age 5 (SR5) were similar number and counting items in the two cultures plus recognition of 22 alphabet letters in the U.S. and 22 hiragana characters in Japan. IQ at age 6 was measured using the WISC-R in the U.S. and the Takemasa-Binet in Japan; the school readiness test (SR6) included letters, numbers, and word meanings items from the Metropolitan Readiness Test in the U.S. and a comparable test developed for administration in Japan. In the follow-up phase of the study, U.S. students were given the Mathematics Concepts and Vocabulary subtests from the Iowa Test of Basic Skills while Japanese students were administered the Japanese version of the WISC-R; teachers in both countries were asked to rate students' academic performance (on somewhat distinct sets of areas).

The differences in the actual tasks administered in Japan and the U.S. meant that Hess, Azuma et al. were unable to compare performance across countries in a direct fashion. Instead, most of their analyses of cognitive measures dealt with their interrelations over time and their predictability from maternal behaviors. Since maternal child rearing practices and causal attributions and their relationships to cognitive development were the primary substantive foci of the investigation, the restriction to cross-cultural comparisons of interrelations rather than performance levels did not pose major problems for Hess, Azuma and their colleagues. Nevertheless, the lack of

manifest comparability of measures across countries constrains the utility of their data for the comparisons of interest here. Below we briefly summarize their comparative results on cognitive measures and comment on their pertinence to other data we have discussed.

Results. The only cognitive measures from the Hess/Azuma study for which between-country comparisons of the level of performance can be made directly are for the Block Sorting Task and the Referential Communications Game administered at age 4. For the Block Sort, Japanese and American children did not differ significantly in their success at placing blocks in groups (mean of 1.71 for Japan and 1.65 for U.S. out of a possible 2.0), but U.S. children were more successful in verbalizing the principles on which the sorting had been done (means of 2.12 (U.S.) vs. 1.53 (Japan) out of a possible 4.0, t=2.28; Hess et al., 1985, pp. 11-12 (ms)). The average number of errors made by U.S. children as senders in the Referential Communication Game was lower than for Japanese children (4.33 (U.S.) vs. 5.82 (Japan), t=2.72; Dickson et. al., 1979, p. 56). The common component of verbalization links these results. Hess et al (1985) suggest that the tendency of American mothers to encourage verbal assertativeness in their children more than Japanese mothers do might account for the differences.

The other cognitive evidence to be derived from the various reports are comparisons of the relationships among the measures over time. Dickson et al. (1979, Table 1, p. 56) reported the intercorrelations among the CFI, PPVT, the Referential Communications Game, the School Readiness Scores at ages 5 and 6

and IQ at age 6. Of the 15 pairs of correlations (within the U.S. and Japan samples separately), the U.S. correlations were higher in every case except between CFI and IQ6 where they were equal; in 9 cases the differences were approximately .20 or greater. When the combined school readiness scores were predicted from CFI and PPVT at age 4, the resulting multiple correlation was not significant in Japan (R=.37) but highly so in the U.S.(.73) (Hess et al., 1983). These results suggest that school readiness is less predictable from cognitive ability measures in Japan than in the U.S., or alternatively, that abilities other than those measured in this study matter. It should be noted that the differences between countries were smallest in most cases for correlations involving the IQ6 measure. In fact for the most part, the patterns of intercorrelations across countries were similar even though the magnitudes differed.

Three of the papers provide information about the relationship of preschool cognitive measures to the cognitive measures collected in the follow-up study. Hess et al. (1983) report multiple correlations between school readiness measures and follow-up scores (presumably a composite) of .61 in Japan and .55 in the U.S. Kashiwagi et al. (1985, Table 2a and 2b, p.84; see also Kashiwagi et al. 1982) present correlations of the preschool cognitive measures with the six cognitive measures in Japan at age 11 and the 5 cognitive measures in the U.S. at age 12. The correlations were generally high in both countries for both the tests and the achievement ratings. For Japan the highest correlations with IQ scores at age 11 were for IQ at age 6 (.58

for Verbal, .60 Performance, .67 Combined, measured using a different test) and form recognition skills at age 4, 5, and 6 (.65, .66, and .75; we were unable to find mention of these measures in other reports). The highest correlations with teacher ratings in Japan were for the school readiness scores at age 6 (.55, .47 and .58). In the U.S. IQ (.65 Verbal, .67 Math, and .73 Total) and school readiness at age 6 (.51, .65, .65) and the form recognition scores (.46, .54, .56) correlated highest with the ITBS achievement scores. School readiness scores at age 6 correlated highest with teacher ratings (.46 and .35), although somewhat less than in Japan.

Kashiwagi et al. (1985) report another set of relations pertinent to our discussion. Apparently, while measures of SES and parental education were correlated with the preschool cognitive measures in both countries, the correlations of these home background factors with the cognitive measures at age 11-12 were only significant in Japan. The authors attribute this result in Japan to "the advantageous educational environment provided by mothers with high SES and education" (Kashiwagi et al., 1985, p. 92).

Summary. The difficulty of conducting cross-cultural, longitudinal research on cognitive development is clearly illustrated by the collaborative effort of Hess and Azuma. The kind of detailed examinations of maternal behaviors and family influences of interest caused them to restrict sample sizes to a manageable numbers and the locales to those easily reached over time by participating researchers. While it was relatively straightforward to use common protocols for observations and

interviews, most of the cognitive tasks had to be adapted to unique conditions in the participating countries. To a certain degree, comparability could only be assumed and not explicitly determined. Stevenson and his colleagues went to greater efforts to ensure comparability of their measures, but their data collection began at about the time that Hess and Azuma's ended. Moreover, the purposes of the two studies differed in ways that placed greater emphasis on test development in the Stevenson et al. project.

Despite its limitations, there are hints of intriguing differences between cognitive development patterns between Japan and the U.S. Hess and Azuma's reports stress the role of the mother in cognitive socialization and cross-cultural differences in that role. They find differences between Japan and the U.S. in maternal teaching styles, strategies of behavior control, expectations for mastery of developmental skills, and causal attributions for performance; moreover, these maternal characteristics are related to school readiness and later cognitive performance but differ across countries. Perhaps, then, the Hess and Azuma investigations' major contribution to this review is to remind us about cross-country differences in the ways in which the foundation for cognitive performance is established through family influences on behavior and development.

Lynn

In 1977, Richard Lynn reviewed the data from the available standardizations of the Weschler tests in Japan. The data he considered were from unaltered subtests for the WISC (standardized in 1951 on 1071 children aged 5.0-15.11), WAIS (mid 1950's for 35-44 year olds), and the WPPSI (late 60's for children ages 4, 5, and 6). Lynn determined the American scaled score equivalent for the mean Japanese raw score on unaltered subtests and converted the subtest results to mean IQ's (actually Performance IQ's since all Verbal subtests were altered during translation). He arrived at 18 separate estimates of mean Japanese IQ and all were higher than the American mean. The mean difference for the WISC across age groups was 3.1 points (about .20 standard deviations) while the corresponding estimated differences for the WAIS and WPPSI were 3.8 points and 11.7 points, respectively.

Lynn (1977, p.70) acknowledged two caveats with regard to these differences. First, it is possible that Japanese sampling methods systematically biased scores in favor of more intelligent groups within their population. Second, the subtests for which differences were most pronounced were largely measures of spatial ability. Nevertheless, Lynn concluded that the evidence supported an interpretation that the Japanese had "the highest mean IQ ever recorded for a national population" (p.70). He then proceeded to cast doubt on the plausibility of environmental explanations for the difference and by inference, claimed that

genetic factors were the most plausible source of the Japanese-American difference.

There is little indication of any reaction to Lynn's (1977) results and interpretations. However, when he later published a follow-up paper entitled "IQ in Japan and the United States Shows a Growing Disparity" in Nature in 1982 (at a time when American business and educational leaders were very interested in Japanese educational and economic successes), his results were widely cited. In later issues of Nature, four comments on Lynn's paper were published (Anderson, 1982; Flynn, 1983; Stevenson & Azuma, 1983; Vining, 1983) along with Lynn's rejoinder (1983). We recount the main points of this exchange below.

In the 1982 article, Lynn reports estimates of Japanese mean IQ for the 1975 standardization of the WISC-R in Japan using, once again, his translation of Japanese performance to the American scale score equivalents. His estimate for the Japanese was 111, 11 points higher (about .70 standard deviations) than the American norm value of 100. Lynn's estimates for the corresponding age cohorts from the 1950 administration of the WISC were 102-105, leading him to conclude that "mean Japanese IQ has been rising relative to the American during the twentieth century" (p.222). Pooling the data from the four WISC standardizations, Lynn concluded that there is a significant secular trend in favor of the Japanese, which he estimated to be about 7 points in a generation. Lynn attributed the increase to improvements in health and nutrition rather than to changes in the genetic structures of the population or to education (since the increase appeared by age 6). The paper concluded with an

extrapolation of the high Japanese mean IQ to comparative estimates of the percentage of the population with IQs higher than 130 (2 standard deviations above the American mean; approximately 2.3% of a normally distributed population have scores this high.). Roughly 10% of Japanese IQ would be expected to be above 130, according to Lynn; moreover, 77% of the Japanese have higher IQ's than the American mean. Based on these results, Lynn concluded that:

> Since intelligence is a determinant of economic success, as it is of success in many other fields, the Japanese IQ advantage may have been a significant factor in Japan's high rate of economic growth in the post-World War II period. (Vol. 297, May 1982, p.223)

The reactions to the paper appearing in Nature seek to elaborate on Lynn's results, on the one hand, and challenge his methodology and interpretations, on the other. Alun M. Anderson, the coordinator for the News and Views columns of Nature and a frequent commentator on Japanese society, accepted Lynn's results at face value and proceeded to offer explanations for the increase in terms of dramatic changes that occurred in the Japanese society during the twentieth century. The factors he cited included "massive post-war urbanization and rapid economic growth and accompanying improvements in welfare, health, education and exposure to Western culture and ways of thought" (Volume 297, May 1982, p.180).

The remaining three comments are critical of various features of Lynn's methodology and interpretations. Vining (1982) pointed out that while the Japanese mean IQ might be higher, the same data sources indicate that the variance in

Japanese IQ was significantly lower. If the Japanese estimates of population variance are used to calculate the expected proportion of their population scoring above 130, estimates of the differences in the percentage of high IQs would shrink considerably (3.5% versus 2.3% instead of the 10:2.3 ratio). Vining clearly indicated that his calculations are only illustrative but does view them as evidence that Lynn overstated population differences in his earlier article.

Flynn (1983) judged Lynn's contentions to be suspect because they failed to take into account differences in the American norming population between standardizations and increases in performance over time. Citing his own studies of differences in the standardization samples for the 1947-48 norming of WISC and the 1972 norming of WISC-R in the U.S., Flynn pointed out that the recent American standardization had a more representative ethnic mixture than the older standardization so that in the case of the WISC-R, Japanese scores are no longer being compared to those of white Americans. Moreover, in studies where both the old WISC and WISC-R were administered to the same set of American children, the average IQs increase by 7.86 points, which Flynn's interprets as a rate of gain in IQ of .321 points per year over the approximately 25-year period between the two standardizations. (These numbers are in line with results from 17 studies involving combinations of WISC and Stanford-Binet tests during the period 1948-1972.) Flynn also pointed out that Lynn failed to include two additional WISC-R subtests where the changes were minor in his calculations. Taking these three factors (the change in American population between

standardizations, the estimated gains in American IQ, and the failure to use all essentially comparable tests) into account, Flynn generated three sets of estimates of Japanese IQs based on WISC-R that are plausible alternatives to Lynn's values. Adjusting for all three factors shrunk the estimated Japanese mean over all ages from 110.7 to 106.6. Flynn also supported Vining's criticism of Lynn's discussion of high IQ scores. He concluded that IQ differences of the magnitude he found are "hardly a matter of national concern", especially considering the gains in American IQ's since World War II.

The criticism by Stevenson and Azuma (1983) focused on the lack of representativeness of the WISC-R standardization sample in Japan and the lack of comparability of standardizations for the two countries. Unlike the American standardization, the occupation of the head of household and urban-rural residence were not used in selecting the Japanese sample. According to Stevenson and Azuma, the explanations for these omissions provided by Kodama et al. (1978) were that these variables were "difficult to consider" or "unnecessary in Japan". Given the extensive evidence regarding the relationship between socioeconomic status and student performance on cognitive tasks (including studies of Japanese samples; IEA, Hess and Azuma) and of urban-rural differences in performance (again, Japanese data from the IEA studies exhibit this difference), these omissions are likely to be consequential. In addition, Stevenson and Azuma reviewed the list of schools with which cooperating teachers were associated and found a clear urban bias. Apparently, 92% of the

classrooms involved in the Japanese standardization were from cities with a population greater than 50,000 although only 64% of the Japanese population resides in this type of community. There were no classes from villages and small towns where 24% of the Japanese population live. Stevenson and Azuma conclude that the Japanese sampling method resulted in a bias favoring higher socioeconomic status and urban residences, which would account in part for the between country differences in IQs. They also view the reliance on strictly Performance subtests in IQ calculations as inappropriate.

In his reply to the critics, Lynn (1983) softened several of the assertions from his earlier article. He considered the urban-rural IQ difference suggested by Stevenson and Azuma to be open to question (citing conflicting results from Japanese studies) but nevertheless provided a recalculation of his overall estimate that took urban-rural differences into account. Lynn also acknowledged the correctness of Flynn's arguments about the differences in racial composition between the American standardizations (and the need to compare Japanese with white Americans) and the inclusion of 7 rather than 5 subtests in deriving estimates; he viewed the argument about the need to adjust for the upward trend in American IQ as more contentious. Once the adjustments suggested by Flynn and Stevenson and Azuma were all taken into account, however, Lynn still estimated a Japanese IQ mean of 104.4 which he judged to be significantly higher than the IQ of American Caucasians. No further mention is made regarding Vining and Flynn's challenge to Lynn's estimates of the proportions of high IQs in Japan and the U.S.

What the above means in the final analysis is hard to say. Clearly, Lynn lost some of the caution he exhibited in the earlier presentation in writing the Nature article. Moreover, he backed away from the evidence that supported his interpretations that were the main points of contention (i.e., the "increasing disparity" and the high IQ differences). What is left is what Lynn would view as a replicable 4 point mean IQ difference between Japanese and Americans, based on Performance tasks only. If the kinds of selective sampling evidenced in the Japanese WISC-R standardization occurred in the other Wechsler standardizations and caused the typical kinds of biases associated with socioeconomic conditions and community type, then all the differences are suspect. We simply cannot tell from the available evidence and documentation what differences in measured IQ really exist between the two countries, and certainly are in a position to interpret their economic implications.

Summary of the Cognitive Evidence--What's There, What's Missing

At the beginning of this section, we delineated eight questions which were intended to serve as guides for our probes into existing evidence regarding the cognitive performance of Japanese students. Currently, popular belief is that Japanese students exhibit superior academic performance when compared with the U.S. Our purpose was to see whether this belief could withstand a detailed scrutiny of the primary empirical studies. Our questions focused on the ways in which the secondary interpretations of Japan's supposed performance advantage might

be misinterpretations, misstatements, overstatements, or overgeneralizations.

We examined in detail seven separate studies with extensive empirical data about the cognitive characteristics of Japanese students that also contained comparable information about American students. Three of the studies dealt with mathematics performance at the secondary level (IEA First International Mathematics Study, IEA Second International Mathematics Study, Harnisch and Sato), one with science at ages ten and fourteen (IEA Crossnational Study of Science Achievement), one with cognitive abilities, reading and mathematics at kindergarten, first and fifth grade (Stevenson et al.), one with cognitive development from age 3 years 8 months to age 12 (Hess and Azuma), and one with IQ (Lynn and his critics).

Looking across the results from the seven studies, our conclusion is that there is substantial evidence from multiple sources to support the judgement of exceptional mathematics achievement in Japan as measured by conventional paper-and-pencil objective tests. The mathematics performance advantage for Japan relative to the U.S. starts early and increases during secondary school. This finding has stood up over time and across the topics covered within the Japanese curriculum (which the evidence suggests is substantially more comprehensive in coverage at any given age level than the typical U.S. curriculum). There are mathematical topics for which the Japanese students have not performed well; however, these topics tend not to have been part of the Japanese curriculum by the time of testing.

Once one ventures outside the area of mathematics (and to some degree science), information becomes sparse and the evidence spotty. We were unable to unearth any comparative data at the secondary level on Japanese performance in reading, literature, social studies, writing, foreign language or other non-quantitative content areas. The little data available from studies conducted in the elementary school years (essentially from the Stevenson et al. study and from the Hess and Azuma collaboration) do not exhibit any distinctive Japanese performance and may actually favor U.S. students, once mathematics and science performance are excluded. Evidence in the realm of cognitive abilities also lends little support to the judgements about Japanese exceptionality (outside of spatial abilities perhaps). Also the data purporting to demonstrate superior Japanese mean IQ appear to be seriously flawed at worst and questionable at best.

The evidence regarding differential performance for identifiable subgroups within Japan appears to be consistent but again is available almost exclusively in the areas of mathematics and science. Variability in Japanese mathematics and science performance is apparently smaller than that in the U.S. during the elementary school years but is greater for secondary school samples. However, when combined with the exceptionally high Japanese mean performance, low scoring Japanese students do well relative to students from other countries. Differences in performance are also associated with socioeconomic status variables and locale of residence (urban, town, rural), in much the same way as in the U.S. The limited data on differences

between public and private school students (primarily from SIMS) does not point to general advantages for private schooling. Finally, there is evidence of gender differences in mathematics and science performance, especially for upper secondary students, but the differences are not large relative to differences found in other countries. In fact Japanese girls outperform the boys from virtually every other country participating in the IEA studies. None of the studies we reviewed provided any insights into ethnic group differences in Japanese performance.

We withhold consideration of the macro influences that might account for Japanese performance until a later section. Nevertheless, it is hard to resist the temptation to offer "arm-chair" explanations for the mathematics and science results and the virtual absence of evidence elsewhere. Our reasoning, strongly influenced by data from the various IEA studies, Stevenson et al., and books by Rohlen (1983) and to some degree, Cummings (1980), is as follows. Start with a society that is concerned about making the most of its human resources and respects and appreciates education and educators. Add a cooperative relationship between the private sector and the government that is committed to developing through education the whole person-citizen who has a command of mathematical and scientific knowledge deemed as essential to economic productivity and progress. Ensure that both the home and the school support these goals. Offer a curriculum (nationally) that emphasizes the development of algorithm reasoning across a wide range of topics, concepts and skills and provide extensive practice in a broad

array of applications. Train prospective teachers extensively in both content and in pedagogical strategies designed to enhance algorithmic reasoning and applied problem solving skills. Develop comprehensive curriculum guides and offer in-service activities that reinforce this orientation.

We get the feeling that Japanese education in mathematics (and perhaps in other subjects as well) does a good job of making the "novel" familiar. Most students become adept at "figuring out what the problem is", recognizing the algorithms that are applicable from among those that they have committed firmly to memory, and then applying the algorithm accurately. Japanese students cover a lot of material in school and spend a good deal of time in what some might view to be "drill-and-practice" work, but there seems to be a clear purpose in approaching instruction in this way. Presumably, through practice, the routine aspects of algorithmic operations become "automated", requiring less time and thought and thereby shifting the mental exercise to one of problem recognition. Experience with a wide array of content and problem types simplifies the problem solving task because the student is more likely to have seen a similar problem before. Moreover, there is continuity over the years in applying "the system"; the student is unlikely to find dramatic shifts in instructional strategy from one year to the next.

In trying to understand why there was so little performance information outside the areas of mathematics and science, we came up with several related explanations. First, there are known difficulties in attempting to transfer language oriented tasks across cultures. What are the English language equivalents to

Japanese characters? How do you control for passage difficulty across languages in reading comprehension, social studies, and literature? These concerns have plagued the IEA studies over the years even when countries shared at least a common alphabet. The difficulties one has to surmount are foreboding as Stevenson and his colleagues clearly portray.

A possible second explanation has to do with wise investment of resources. Whether it is true or not, the Japanese do believe that human capital in the areas of mathematics and science is important to their economic prosperity. Therefore, they are willing to invest in efforts that help them document the state of knowledge in these areas and how their students are doing comparatively. While learning is important in other areas also (the well-educated and well-rounded citizen), it is not the focus of concerns regarding economic development and besides, it is harder to examine performance in other areas comparatively. Therefore concentrate and invest resources in what is most important.

The other side of the coin to the above is that one should "put one's best foot forward" in public. Japanese educators, and business and governmental leadership, are proud of the image derived from their country's performance in international comparisons of educational achievement. It reflects well on the society as a whole and apparently impresses business and governmental leadership in other countries. Yet, outside of the mathematical and scientific areas, the emphasis in Japanese schooling might be sufficiently distinctive from that in Western

Europe and the U.S. to make it more difficult to reflect the accomplishments of Japanese students. Coupled with the difficulty of developing culturally fair tests in content areas that are heavily language dominated, why invest the effort and still risk the possibility of conveying a misleading impression about the quality of Japanese schooling outside of mathematics and science?

What is distinctive about curriculum in Japanese schools (from an American perspective) in areas other than mathematics and science? While it was outside the scope of our task to delve into details of the Japanese school curriculum, several of its features stood out in the materials we read. First, while it is widely known that students in Japan spend more time in school during a year than U.S. students, it is less well-known that this additional time is spread among more subjects for more years than are part of the typical U.S. curriculum. According to the international studies and various other reports, Japanese students study take 9 subjects through the end of the lower secondary school compared with the 6 subjects in the U.S. English, Music, Art, and Moral Education are part of every student's course of study until the upper secondary level (10th grade).

Second, coursework in all areas is more systematic, comprehensive, and uniform than the U.S. Music is a case in point. According to Abdoo (1984), Japanese music education covers a combination of music history, theory, conducting, instrumental and choral performance, and reading and writing of music at progressively more complex levels through the ninth

grade; both Western and traditional Japanese music are studied. Abdoo claims that by the time of graduation from lower secondary school, almost every person can read music and has the basic historical and theoretical tools to enjoy it. Coursework in social studies, humanities, literature, and the arts also appears to be broad-based with heavy doses of Western culture and thought. Rohlen (1983) notes that "social science textbooks encourage the development of a high level of competence and sophistication both in the facts of civics, history, and geography and in the principles of economics. Most high school students can understand economic and social policy,... grasp the interplay of domestic and external factors" (p. 256).

A third feature worth noting is the nature of the learning rather than its content as one progresses through the secondary school years. There appears to be an emphasis on what might be termed convergent (as opposed to divergent) thinking skills. Instructional emphasis is heavily oriented toward mastery of facts, attention to details, and developing the skill to apply information and theory to solving problems. This orientation is dictated, at least in part, by the importance of the examination system (both for upper secondary school and university eligibility) which typically emphasizes objective, selection (multiple choice, short answer) questions and excludes production (essays and written composition) ones.

Rohlen (1983, pp. 93-101) presents examples of questions from university exams that, in his view, epitomize the thrust of Japanese curriculum in secondary schools. In one question,

students are asked to fill in 15 blanks appearing in a long passage on ancient Greek thought, choosing their answers from a list of 40 names, places, dates, eras, and schools of philosophy. The subject matter of the passage, so central to an understanding of the history of Western thought, is not likely to be part of the schooling of American students until their early University years, if at all. Even then we would expect to find less focus on the mastery of facts and details and more on what Greek philosophy has to say about independence of thought and rationality. The same sort of emphasis is seen in exam questions taken from other areas outside of mathematics and science.

In our attempt to portray the focus of instruction in Japan, especially during the secondary school years, we are not trying to judge the appropriateness of its emphasis on memorization of facts and attention to detail. The same point holds for our attempts to explain the reasons for Japanese performance in mathematics and science and the limited availability of comparative evidence in other areas. It would be the height of cultural arrogance to view Japanese society and schooling from a narrowly American perspective. The activities and actions that characterize Japanese education and the characteristics of its citizens, and the choice of information to collect about them, are dictated by values, purposes, and needs of their society and culture, not by ours. If a difference in interests and emphases causes data about their characteristics to be noncomparable to U.S. data (the standardization of the WISC-R in Japan is a case in point as is the general indifference to providing information

about occupational status), this limitation should be viewed as an inherent feature of cross-cultural comparison rather than a shortcoming or an evasion of the issues that the data might help us (Americans) address.

Non-Cognitive and Behavioral Characteristics

As part of the desired scope of work, we were requested to include an examination of the literature on non-cognitive and behavioral characteristics in addition to the review of cognitive data. The non-cognitive characteristics we were to consider included self-concept, locus of control, aspirations, expectations, and values (self-responsibility, self-criticism, group responsibility, loyalty, and perserverance). The proposed list of behavioral characteristics included coping behaviors, task orientation, group functioning, productivity, motivation, and creativity.

At the time, this list seemed reasonable. While there are differences of opinion in the American research literature with regard to the meanings of some of these characteristics, and the best approaches to measuring them, one would expect to find comprehensive bodies of literature about each of them.

Our search for a comparable literature on non-cognitive and behavioral characteristics of Japanese students yielded very little empirical data on most attributes. While there is no shortage of statements about the character and behavior of the Japanese (children included), there is apparently less of a tendency to attempt to document the prevalence and diversity of specific attributes. Several of the studies reviewed in the

cognitive characteristics section did collect school-related attitudinal and behavioral data (e.g., attitudes toward school and subject matter; amount of homework, time use outside of school) and the Hess and Azuma collaboration gathered extensive information about child-rearing practices and causal attributions. But other than these and a limited number of comparative surveys of youth (which we will report on below), the cupboard was almost bare.

We have tried to figure out why our search yielded so little. Perhaps, our inability to work comfortably in Japanese language professional journals (Yet our examination of several volumes of Japanese Psychological Research, published in English, turned up nothing relevant) or to obtain and examine a larger volume of governmental reports in Japanese severely impaired our work in this area. However, if this interpretation is plausible, others have suffered similar fate. None of the essay reviews (e.g.,Rohlen, 1986; White, 1983), popular articles (e.g., Schiller and Walberg, 1982; Torrance, 1980) or books (e.g., Cummings, 1980; Rohlen, 1983) cite sources of survey, observational, or personal interview data on most of the attributes listed above. These papers and books do, on occasion, report data, primarily from Japanese governmental reports, on such attributes as juvenile delinquency, social and family relations, and suicides. But for the most part, Americans writing about Japanese behavior and non-cognitive attributes seem to rely on their own observations of Japanese culture and society or on Japanese commentary about personal, family, social,

cultural, and spiritual values, beliefs, and goals to guide their statements and interpretations of Japanese characteristics.

Our choices about how to proceed, then, are limited. We will report on the empirical data we found and also cite statements from secondary sources that lack empirical documentation. But by doing this, we run the risk, as in the cognitive characteristics review, of providing an imbalanced picture of actual circumstances regarding non-cognitive and behavioral attributes. Moreover, the inferences are likely to be more strained than for the cognitive data.

The point here is that the cross-cultural transportability of American conceptions of non-cognitive attributes and behaviors to Japanese society and culture might be even more problematic than in the cognitive domain. The American penchant for "psychologizing" about individual attributes and behavior many not mesh well with the Japanese collective sense of personal and social responsibility or their agenda for the study of human behavior.

New Data Sources

In addition to the studies that were considered in the examination of cognitive characteristics, two other comparative studies that gathered survey data on the attributes are central to this part of our analysis.

HS&B in Japan. In 1980, the Japan Youth Research Institute conducted a partial replication of the High School and Beyond (HS&B) Study, initiated in the U.S. by the National Center for Education Statistics (NCES)B. Questionnaire data were gathered in Japan from a sample of 7,239 high school seniors drawn from 46

schools; HS&B collected both questionnaire and cognitive test data from a probability sample of roughly 30,000 sophomores and 28,000 seniors from approximately 1000 public and private schools. A preliminary report comparing the responses of American and Japanese high school seniors was prepared by NCES staff (Fetter, Owings, Suter, & Takai, 1983) and is our only available written source at the present time. However, it is our understanding that other analyses of these data (plus a possible follow-up sample in Japan) are in process.

At the time of the Fetters et al. report, information about the Japanese sample design was not yet available. However, K. Yamaguchi (who worked on HS&B while at the National Opinion Research Center and is now a faculty member in Sociology at UCLA) provided us with a brief translation of the description of the sample design provided by the Japanese Youth Research Institute (Tamotsu Sengoku). According to Yamaguchi, the Japanese employed a three-stage cluster sample (region (stratified into big cities, city-prefectures and all others), schools (stratified by size, and type (public general, public vocational, private)), and classes (randomly sampled with students exhaustively surveyed)). Apparently, the sample of schools selected was based on proportional allocation rather than on probability proportional to size.

The student survey focused on the behavior and activities of students and their attitudes toward themselves, their school, and their teachers. Several questions asked in the Japanese survey were not directly comparable to HS&B items administered in the

U.S. Fetters et al. describes their adjustments to the item data to allow for cross-country comparisons and are careful throughout the report to note when differences might be attributable to changes in question wording or response options. Their review summarizes the findings under the major categories of curriculum, school effort, student opinions about school, parental control and influence, out-of-school activities, values and attitudes, and plans and expectations.

Third World Youth Survey. In 1983 the Youth Development Headquarters of the Prime Minister's office in Japan conducted the third in a series of "World Youth Surveys" (WYS; Youth Development Headquarters, 1984). According to the report, the previous two surveys had been carried out in 1972 and 1977; however, we were unable to locate any earlier reports or citations of the earlier studies as data sources.

The stated purpose of the WYS was "to determine the major problems confronting young people in Japan, to help work out future policies for young people, and to obtain basic data that is necessary to promote mutual understanding between the youth in Japan and in foregn countries"(Youth Development Headquarters, 1984, p.1). Eleven countries (Japan, U.S., United Kingdom, West Germany, France, Switzerland, Sweden, Yugoslavia, Philipines, Korea, and Brazil) participated in this survey of young people aged 18 through 24. A research institute in each country was commissioned to obtain 1000 interviews. In Japan 1,021 interviews were obtained by the Nippon Research Center, Ltd. using a stratified two-stage random sample; 1134 interviews were obtained in the U.S. by the Gallup Organization, Inc. using a

replicated probability sample. The interviews were conducted in person in the respondent's home.

The material we were able to obtain (through our project monitor) was very brief. The summary of major findings from cross-national responses to questions about family (12 items), school (6 items), job (11 items), friends and free time (5 items), comunity and delinquency (3 items), nation and society (5 items), international issues (2 items), and outlook on life (9 items) were reported in under 20 pages of text. This limited body of information is all that we have to go by in examining the results of this potentially interesting source of information. We will concentrate in our report on questions that are most closely tied to the attributes delineated at the beginning of this section, and on those items that reflect distinctive Japanese attitudes and behavior (as characterized in the report).

Information about Specific Attributes

The attributes to be considered cluster roughly into two groups. The first set includes measures that reflect beliefs, interests, attitudes, and feelings. Data regarding a variety of behavioral characteristics constitute the second set.

Self-Concept. Despite the substantial body of American literature involving judgements of one's value and abilities along a number of dimensions (primarily called self-concept or self-esteem), data on the self-concept of Japanese students is limited. Fetters et al. (1983, Table 6) reports the percentage of high school seniors that agreed with 3 statements on self-esteem:

I'm a person of worth.
I'm satisfied with myself.
At times, I think I'm no good.

and another question about ability to enter (in Japan)/complete (in U.S.) college.

Japanese responses to the questions about worth and self-satisfaction were much less positive than Americans; less than a third of the Japanese students agree with these statements while more than 80% of the U.S. responded positively. On the third question, there was a higher percentage of negative response for Japanese, especially for females (71% agreeing with the statement that they felt they were no good at times in contrast to 49% for Japanese males and 51% and 41% for U.S. females and males, respectively). The question about college showed a similar Japan-U.S. pattern with over 80% of the U.S. seniors judging themselves able to complete college while less than 40% of the Japanese stated that they had the ability to enter college (Since the dropout rate from college is negligible in Japan, entering is essentially tantamount to completing college).

If the Japanese results had come from a typically American sample, there might be cause for considerable concern. The responses to most self-concept questionnaires from U.S. samples are typically skewed with substantially more positive than negative replies, except in clinical samples.

This tendency toward self-critical judgement by Japanese is apparently not an isolated event but more of a consistent pattern. Japanese students in the Harnisch and Sato study (Harnisch & Sato, 1983; Harnisch et al., in press) had more

negative reading self-evaluations than Illinois students. In draft materials on student opinions, attitudes, and preferences from SIMS, Kifer and Robitaille (in press) found that despite their high cognitive scores, Japanese students from both Populations were more likely than students from other countries to consider school mathematics to be hard and to have low opinions of their performance in mathematics.

We attribute the patterns of responses above to distinctive cultural tendencies in socialization regarding appropriate expressions about self-judgment. Within Japanese society humility is valued as an essential ingredient of interpersonal harmony while overconfidence and public expression of beliefs that might reflect negatively on others are discouraged. American society, on the other hand, places a higher premium on self-confidence and self-assurance, and its competitive tendencies afford greater tolerance for and encouragement of public expression of one's capabilities.

What this means in terms of "true" differences in the distribution of self-concept between Japanese and American students is unclear. Japanese students, as a group, may be overly self-critical, professing greater concerns about their worth and abilities than they truly believe. On the other hand, their self-opinions might also reflect realistic reactions to the tightly connected system of secondary and post-secondary educational stratification. In contrast, the responses of U.S. students are more likely to reflect overconfidence and weaker societal linkages between school performance,

opportunities, and self-esteem.

Locus of Control and Attributions. This category of attributes deals with the tendency to judge whether the factors responsible for individual actions and performance are under one's personal control (internal) or not (external). Current emphasis in applications of the locus of control construct in academic contexts is on an individual's causal attributions for their success or failure. Attributions to personal ability and effort are viewed as internal (but vary on other dimensions in Weiner's theory) while those to task difficulty, luck, and fate are considered to be external factors beyond the control of the individual. Among the internal factors, effort is considered to be a changeable behavior while ability (or aptitude) is seen as a more stable personal characteristic.

The evidence from Japanese-U.S. comparisons with respect to locus of control and causal attributions for success and failure is mixed, seemingly varying across time and age group considered. The First International Mathematics Study included an 18-item scale intended to measure "the extent to which man is perceived as having effective control of and mastery over his environment" (Husen, 1967, Vol II, p. 45; Tables 1.15-1.19). At all three population levels considered (13-year-olds, terminal year mathematics students, terminal year non-mathematics students), Japan exhibited high means (ranked 1st or 2nd among the countries) and low standard deviations while U.S. means were much lower (close to the bottom ranking) and the scores more variable. This meant that on the whole, Japanese students were more likely than students from other countries to feel that mankind has

control over its own fate while American students were more likely to view mankind as helpless in the face of forces at work in the world.

The remaining studies focus on the relative prevalence of ability, effort, luck, and task difficulty in causal attributions regarding success and achievement. During the follow-up phase of the Hess and Azuma study (the Japanese students were in the 5th grade while the Americans were in the 6th grade), both students and their parents were asked about their attributions for low performance in mathematics (Hess et al., 1985; Holloway et al., undated; Note that there were some differences in administration procedures between countries. Also the sample of Japanese mother-child dyads was augmented to partially offset attrition problems associated with parental unwillingness to participate in this portion of the study and to failures to return the mail questionnaires.). Both Japanese children and their mothers were less likely to attribute poor performance to lack of ability and training in school and more likely to attribute it to lack of effort than American children and their mothers. American children were also more likely than Japanese children to blame poor performance on bad luck. At an earlier phase of the study (when children were 4), Japanese mothers were more likely to emphasize children's natural abilities (effort and ability were not separated in this part of the study) and less likely to emphasize parental encouragement as reasons for their children's future success in school. The report authors interpret their results as supportive of a Japanese belief in individual

responsibility for and control over success; i.e., internal changeable factors such as effort are more important than either internal stable factors (ability) or external factors (luck, task difficulty, quality of teaching).

The pattern from the Hess and Azuma study is evident but to a lesser extent in students' success and failure attributions regarding test-taking in the Harnisch and Sato study (Harnisch & Sato, 1983; Table 1). Although effort was the most frequently chosen reason for either success or failure in both countries, Japanese students were less likely to attribute success to ability and more likely to attribute it to luck or task difficulty than U.S. students. Effort was a more likely attribution, and task difficulty a less likely one, for failure in the Japanese sample. The Harnisch-Sato results for the success condition seem to reflect a mixture of two Japanese attributes: humility and assuming individual responsibility. The failure results more neatly match other evidence from the internal-external control paradigm applied in academic contexts.

The report on the WYS (Youth Development Headquarters, 1984) states that personal effort and person abilities were ranked as the first and second choices in Japan and most other countries as reasons for success in school. Apparently, luck or fate was a more popular choice in Japan, and good education a less popular one, than in many countries.

The results from the HS&B comparison (Fetters et al., 1983) with respect to locus of control appear to be at odds with those found elsewhere. While only a quarter of Japanese seniors agreed that "good luck is more important than hard work for success",

this percentage was more than twice as large as that for American seniors. Moreover, Japanese students were less likely to agree that "what happens is my own doing" (59% versus 77% for the U.S.). Finally, the question "Plans hardly ever work out" provoked a remarkably higher percentage of agreement in Japan (74% versus 23%).

Frankly, we don't know quite what to make of the HS&B reversal of the pattern wherein Japanese appear to place greater emphasis on effort and personal responsibility than comparable American samples. The timing of the HS&B survey may have been a factor in Japan; if the survey was conducted late in the senior year, Japanese students may have been at a point of maximum stress (or maximum disappointment) with respect to pending or completed university examinations. Such an interpretation would also fit with the more negative self-evaluations regarding self-esteem and ability to enter college.

On the other hand, the data from HS&B on self-esteem and locus of control may reflect a recent undertone of general dissatisfaction and unrest among Japanese youth at this sharply demarcated juncture in their educational system. The tight coupling between educational performance and occupational opportunites places substantial pressure on this age cohort. The limited data from the 1983 administration of the WYS also contained some indications of comparative dissatisfaction in Japan (lower ratings of satisfaction with home life, somewhat lower satisfaction with school life and apparently markedly lower dissatisfaction with life at work; the trends from the previous

survey were also toward decreasing satisfaction). We may be noticing growing frustrations with the sustained dependence on the family and limits on social relations with peers accompanied by a dampening of the willingness to take the long-range view on the part of Japan's "old adolescents" when juxtaposed with perceptions of the independence and freedoms enjoyed by the American age peers. (Rohlen (1983) describes circumstances that might foster such reactions.) But this is all very speculative.

Another explanation for the confusion surrounding locus of control and causal attributions for Japanese in the academic domain is that the area of academic pursuits may be anomalous with respect to Japanese control-relevant behavior in other areas. In a recent comprehensive review, Weisz, Rothbaum, and Blackburn (1984; Comments from two eminent Japanese psychologists, Hiroshi Azuma and Hideo Kojima, accompanied the Weisz et al. publication.) identify two general paths to a feeling of control and contrast Japanese and American perspectives and practices in child rearing, socialization, religion and philosophy, work, and psychotherapy. According to Weisz et al., Americans emphasize and highly value primary control, whereby individuals are rewarded for influencing existing realities. Japanese, on the other hand, place greater emphasis on secondary control, whereby individuals receive "rewards by accomodating to existing realities and maximizing satisfaction or goodness of fit with things as they are" (Weisz et al., 1984, p. 955).

Weisz et al. report that of the five studies they found comparing locus of control, the Japanese scored as significantly more external than Americans in all of them. Japanese were more

likely to see fate and luck as influential, perceive themselves as less able to alter others' opinion of them, view the world as a capricious place where people do not always produce the outcomes they deserve, and believe that individuals can have only limited effectiveness acting alone (These are Weisz et al.'s reports on the contents of the articles. We have not examined them first-hand.).

In their discussion, Weisz et al. repeatedly point to the emphasis Japanese place on maintaining harmony and on alignment with and obligation to family and group (friendship, work group) members. The apparent inconsistency they cite in the academic domain (p. 960) is seen as an extension of an individual's commitment to enhancing their family's standing, which Weisz et al. see as a form of secondary control.

The two Japanese commentators on the Weisz et al. review express appreciation for their perceptive and generally sensitive portrayal of Japanese control strategies. Nevertheless, their comments highlight the difficulty of applying a distinctively American primary-secondary dichotomy to the Japanese culture. Azuma points to the need to focus on the nuances in secondary control (using the Weisz et al. scheme) in Japan. Kojima suggests that between-country differences in the nature of socially accepted modes of primary control deserves more consideration and that certain relations classified as secondary in American culture are better perceived as primary in Japan.

Our discussion of the Weisz et al. article and comments by Azuma and Kojima does not do justice to the subtleties in this

multifaceted examination of the complex concept of control. Perhaps, however, it serves as an appropriate reminder that one's perception of a cultural attribute depends on both the cultural perspective from which one operates, on the structural paradigm one invokes, and on the aspects of behavior one considers. Otherwise, one is likely to misconstrue the descriptive evidence which, depending on vantage point, highlights either the internal or external facets of control exhibited by Japanese.

Toward School and Subject Matter. The IEA studies are the primary sources of information about school-related attitudes. In the First International Mathematics Study, Japanese students ranked either 1st or 2nd among countries in terms of their attitudes toward school and school learning; the attitudes of U.S. students were typically much less positive, placing them at or near the bottom internationally. On questions related to interest in mathematics, the picture was more mixed. Japanese 13-year-olds and terminal year non-mathematics students were above the international means for their respective populations but terminal year mathematics students were slightly below the international means. The average interest scores for U.S. students were higher than for Japanese 13-year-olds and terminal year mathematics students.

The cross-country comparisons from the IEA Science Study also indicate that Japanese attitudes toward schooling tended to be positive. Their means on the Like School scale at both age 10 and 14 ranked 2nd among the developed countries (the U.S. was 3rd). Science Interest and Activities scores for Japanese 10-year-olds were were the highest internationally (U.S. ranked 3rd)

while the corresponding scores for 14-year-olds were closer to the international median (ranked 6th versus 4th in the U.S.).

There were no general school attitude questions included in the Second International Mathematics Study. The draft of the chapter by Kifer and Robitaille reports that the Japanese students at both population levels ranked lowest on the Mathematics in School scale (indicating a greater dislike for the topics that were universally part of the mathematics curriculum than students from other countries) and on the Mathematics and Myself Scale (containing items on willingness to persevere in mathematics, self-perceptions of mathematics performance, and intentions to pursue the study of mathematics).

Both the WYS and the HSB surveys report evidence of negative attitudes toward school by Japanese students. As mentioned earlier, Japanese students had a somewhat lower percentage that indicated school satisfaction than in most other countries. Their reasons for dissatisfaction (poor teaching, inappropriate vocational and educational counseling, inadequate facilities and equipment) were the same as in other countries.

In HS&B, Japanese students were substantially less likely than American students to rate all aspects of schooling considered (physical plant, library, quality of academic instruction, reputation in community, fairness of discipline, school spirit) as good or excellent. In most cases, the percentage of positive ratings was three times higher in the U.S. Japanese students were also more likely than U.S. students to believe that their school should have placed more emphasis on

basic academic subjects and did not offer enough practical work experience and less likely to believe that the school should have placed more emphasis on vocational and technical programs. On the other hand, Japanese students were more likely to agree that their school provided continuing education and employment counseling.

Here, again, we find that the most recent evidence (from the early 1980's) suggests that the attitudes of Japanese students were more negative than in the 1960's and 70's and also were more negative than the attitudes of presumably comparable American cohorts. We are tempted once more to interpret the pattern as a reaction to the tremendous academic pressures on Japanese secondary school students, who choose to express their bitterness in a manner that has no impact on their academic standing.

Educational Expectations. That the pressures are greater on Japanese students than American students completing secondary school is quite clear. Evidence from both the WYS and HS&B surveys and from Rohlen (1983; 1986) point to the higher educational aspirations for Japanese students. They ranked highest on the WYS. On the HS&B survey, approximately 10% more Japanese students aspired to finish college or graduate school than U.S. students expecting to achieve these levels of education although the pattern was reversed for females. These trends represent a departure of sorts from the earlier data on educational expectations taken from the IEA surveys; Japanese 14-year-olds in the Science study actually had a mean expectation two years lower than the U.S. mean and ranked only 6th (although the data from certain countries were questionable).

The pressure to go to the right university is substantial. Japanese students rarely change universities or fields of study. There evidently is also a strong correlation between job opportunities and the university one attends. Since Japanese tend to change jobs and companies less often during their career than Americans, the decision point at the end of secondary school has life-long consequences for Japanese students. Rohlen (1983; 1986) vividly depicts the growing presence of students (called rōnin) who fail to get into the university of their choice on the first try but choose to study and retake the examination rather than choose another university or seek employment. There is simply no comparable point in the American educational system where the stakes are so high. Under such conditions, there should be little wonder if Japanese secondary school graduates were more likely to experience frustrated ambitions and express their frustration through their survey responses.

Other Attitudes. As one moves away from the academic domain, few of the studies we considered in detail have much information. Rohlen's book (1983) reports on his 1975 survey of students from five Kobe high schools including information about student friendship patterns. The World Youth Survey (Youth Development Headquarters, 1984) collected data on such topics as perceptions of actual and ideal parental roles, satisfaction with home life, satisfaction with life at work, aspects of social relations, attitudes toward the community and society, and outlook on life. Fetters et al. (1983) report Japan-U.S. comparisons on life and work choice values.

We will not review the details of the non-school related attitude data reported in these sources. For the most part, the response patterns within the studies are consistent with expectations based on popular accounts of Japanese society and culture or with other evidence reviewed here. For example, Rohlen's friendship results show systematic differences across high schools that appear to be associated with the school's academic status. The Fetters et al. survey found substantially greater emphasis on job security and permanence than on beginning income in the Japanese sample, as expected, while U.S. students tended to rate the two as equally important. In the WYS, the Japanese were less likely than Americans to choose "to live as I like" as an aim in life but more likely to choose "to get rich". There were perhaps fewer curious results than for the other non-cognitive attributes considered thus far.

A Sample of Behavior. Our information on the behavioral characteristics of Japanese students is spotty in most areas. A substantial body of evidence has accumulated about the amount of time Japanese students spend on academic pursuits outside of regular school hours. Several sources (Comber & Keeves, 1973; Fetters et al., 1983; Husen, 1967; Rohlen, 1983, 1986) report that Japanese students spend more than twice as many hours per day doing homework than American students; they also tend to take more courses and more advanced courses in school and are absent less often. Moreover, the U.S. (and apparently other countries) have nothing comparable to the Japanese jukku or yobiko cram schools offering supplementary schooling. Rohlen (1983) cites figures indicating that well over half of Tokyo's students beyond

the fourth grade (over 25% nationwide, according to his 1986 paper) attend one of these schools or have a private tutor. Coupled with the longer regular school year, longer school week, and the special vacation schools attended by many Japanese youth, there is clearly much more time devoted to academic matters with a consequential payoff described in earlier sections.

Skipping to the opposite end of the spectrum, Rohlen (1983) reviews the data on juvenile delinquency patterns in Japan. While differences in reporting systems introduce certain obstacles to cross-cultural comparisons, he nevertheless points to substantially lower crime rates among Japanese youth than for American teenagers. Rohlen cites statistics indicating an increase in juvenile crime during the 1970's but points out that the increase occurred primarily for lower secondary school students. He also provides data that indicate a correlation between delinquency rates and school rank (defined by university examination results).

Critics of Japan's high-pressure educational system often point to youth suicide rates as a negative consequence of the system. Rohlen's examination of the data is again most useful for our purposes (Cummings (1980) also discusses the suicide issue). He points out that the World Health Organization figures indicate that the Japanese suicide rate for the 15-to-24 age group peaked in the mid 1950's, dropped dramatically by the late 50's and stayed low for males through the early 70's (female rates remained high). Considering data from a number of sources, Rohlen concludes that examination pressures and poor academic

performance are major causes for suicides among persons under twenty in Japan, more so than would be the case in other countries.

Time use outside of school is another area of apparently marked differences between Japanese and American youth. Fewer Japanese students hold part-time jobs or spend considerable amounts of leisure time with their friends outside their homes (either dates or other socializing; Fetters et al. and Rohlen (1983) are our sources for this information). They are more likely to spend time at home with their families and concentrate on their studies.

There is an extensive literature on the distinctions in family relations and child rearing practices between Japan and the U.S. Rohlen (1983) and Cummings (1980), to a less extent, portray the close bonding and interdepencies established between child and parents (especially the mother) early on and maintained until young adulthood (See also references in Weisz et al. (1984)). The Hess and Azuma collaboration provides a wealth of data on the contrasting patterns of developmental socialization as practiced in Japan and the U.S. (reported in the many papers already cited; Hess et al. (1985) provides a comprehensive summary of the major distinctions.). For example, they found that Japanese mothers encouraged compliance, politeness, and emotional maturity at an earlier age while U.S. mothers expected social skills with peers and verbal assertiveness at an earlier age. According to Hess and Azuma, Japanese mothers were more concerned with orienting the child toward proper behavior with adults while the U.S. mothers were more concerned with effective peer

behavior. They also point out differences in maternal teaching styles.

Creativity. The topic of creativity proved to be a difficult one to examine. Even within a culture, conceptions of what creativity involves and how it is demonstrated vary considerably. Moreover, regardless of the choice of conception, we were unable to find much empirical evidence (it may exist but not in the sources we located and examined in detail). What we were able to obtain were a few interpretative summaries (Schiller & Walberg, 1982; Torrance, 1980). This leaves little on which to base our analysis of this characteristic of Japanese students.

What does seem to be clear, however, is that discussions of Japanese creativity revolve around definitional differences and cultural stereotypes. From an American perspective, creativity is often viewed as the ability to diverge from normative thought and knowledge-- demonstrating novel ways of looking at phenomena, going beyond what is known, being able to perceive or generate unique facets of concrete objects and abstract ideas. The alleged Japanese penchant for accumulation of facts and information, attention to details, and emphasis on applied problem solving (as reflected in supposed scientific focus on adapting and improving existing technology as opposed to the "creative" pursuits of abstract theory and invention) causes one stream of American opinion to view Japanese as not being very creative relative to Americans. Others (such as Torrance and Walberg) point to Japan's leadership in inventions and patents, the reverence and respect accorded to its artisans (literature,

drama, music, dance, art), and its high levels of literacy and musical talent, all signs to them of a highly and broadly creative society and culture.

The divergence of opinion about Japanese creativity seems to us to have the aura of a squabble about "scoring rules". Earlier on, we argued that Japanese schooling attempts to turn the novel into the familiar through broad curricular coverage, emphasis on problem solving across a wide array of applications, and extensive purposive practice. If our characterization is accurate, then by one groups' scoring system, few Japanese get points for creativity because it is harder to diverge (in a positive direction) from their higher norm. Japan's collective, purposive approach to the world of knowledge, thought, and behavior works against them when judged by the typically American scoring rules.

Whether it matters how one views Japanese creativity would seem to depend more on what one perceives to be the consequences of differences in cultural choices and this, in turn, depends on what's being valued. A country's economic prosperity, intellectual climate, and quality of everyday life have all been attributed by some authority to the creativity (and intelligence; the two seem to be linked invariably) of its people. It seems to us that Japan and the U.S. are countries whose distinctive cultures embody different routes to achieving similar but not absolutely congruent goals. Using strictly one country's criteria to evaluate an attribute such as creativity in the other results in invidious comparisons that are more likely to mislead than illuminate.

Summary of Non-cognitive Evidence: Perplexing Patterns

At the outset of our discussion of the empirical evidence on non-cognitive and behavioral characteristics of Japanese students, we expressed some misgivings about whether an adequate portrayal was possible. We believed, and still do, that the distinctions between Japanese and American culture reverbate in strong and complex ways upon the attitudes and behavior of their respective youth populations. The likelihood of being able to accurately depict, through the filter of American psychological theories and paradigms, what Japanese youth believe seemed remote.

Thus it came as no surprise that the picture unveiled through the various articles was sometimes very puzzling. Do Japanese students really have lower self-esteem than American students or are we simply witnessing culturally proscribed modesty and humility? Do they consider themselves to be internally controlled masters of their own destiny through their willingness to persist and to commit the necessary effort for success, or are external control mechanisms a more compelling force in their lives? Have their school-related attitudes really turned more negative over time or are we picking up merely adolescent flailing at a convenient target? Is their willingness to sacrifice for family and for future success still strong or is it crumbling under exhausting and lengthening academic pressures? If attitudes are changing, can behaviors be far behind?

When we try to apply peculiarly American perspectives to the evidence in hand, we become perplexed. Most Americans cannot

even began to conceive of living and behaving according to the Japanese code of conduct; they would probably find it too confining. It works the other way as well for most Japanese, used to a society with scarce physical resources that must be compensated for by maximizing human resources, cannot fathom "squandering" physical and human resources in the haphazard American manner.

We are left, then, with a realization that while we were able to observe differences between Japan and the U.S. in non-cognitive and behavioral characteristics, we were not able to fully understand or explain them. We are comforted, however, by the fact that we are not alone; more knowledgeable commentators on Japan have apparently found this part of the terrain equally treacherous.

Literature Related to Non Cognitive Factors Influencing Student Characteristics

In this section, a multi-dimensional approach will be followed to assess the literature on several factors. The basic content focus is that which relates to the non-cognitive context in which Japanese education functions. In each case, the authors of the articles surveyed have suggested that the products of the Japanese educational system achieve higher than world standards due to one (or more) of the following four factors: 1) relationship between education in Japan and economic development; 2) educational achievement and educational administration; 3) the curriculum and educational achievement; 4) educational achievement as a function of culture. In addition, there are

system is superior and produces overachievers. Articles in this category will comprise a fifth factor; and 5) the critique. Within the content focus, each subsection (1-5) will be further discussed in terms of a) Level and type of education (elementary, secondary, special populations); b) Quality and credibility of citations; and c) Quality and credibility of authors.

Education and Economic Development

The link between education and economic development has been the subject of numerous books and articles since the so-called development decades which began in the 1950's. Much of this literature was focused on third world nations in Africa, Asia and Latin America. Little attention was paid to Japan which typically was considered to be "developed" particularly after the 1960's. Bowman's study (1981) is one of the few book length studies to focus on the links between educational choice and labor markets. She explored the various decision levels facing students, from the upper-secondary stage to higher education. In this study, she clearly establishes strong economic factors influencing educational decisions. This is book macro in scope and thoroughly documented.

Two additional important studies also explore this economic issue, one historically (Allen, 1978) and the other focusing on the contemporary issue of the transition from school to work (Ushiogi, 1984). Allen's study is a well researched and documented analysis of the development of Japan's educational system being regeared to focus on science, technology, and professional or vocational training during the early Meiji period

(1868). He demonstrates how a concerted effort by both government and individuals resulted in the close link between education and nation-building that continues to characterize Japan's development today. What is important for the purposes of this literature review, however, is that early on the notion that education was closely related to economic development was imbedded in the thinking of individuals in both government and business. As Allen (1978: 33) notes: "In neither sector [government and business] , however, was educational policy fashioned by men committeed to the belief in the sufficiency of liberal education; it seemed essential to them that adequate provision should also be made for professional and vocational training, directed towards producing experts." It was with this early beginning that education became the route to a successful career prompting Allen (1978: 34) to state: "Many critics have claimed that Japan has placed too much emphasis on formal educational qualifications as a path to a career, and there is some justification for such a charge." From that point on, most aspects of Japan's formal educational system were imbued with the concept that one studied, in preferred schools, in order to have a successful career. This "career" orientation lays the base for the manner in which schooling is viewed by all sectors in Japanese society down to and including students and their parents. While Allen does not link his study to student achievement it is likely that the rather direct relationship between education and economics is a powerful motivator.

Ushiogi (1984) brings this argument up to date with his study of the transition from school to work in Japan. In this study he traces the rapid expansion of higher education in Japan since World War II and the impact this has had on the Japanese labor market. He convincingly demonstrates that the educational experience that one has in Japan directly determines career paths and that students are motivated primarily by this knowledge. The motivation to study and choices on what to study comes from the knowledge that large business enterprises prefer to recruit students from faculties of law, economics, business management, commerce and engineering (Ushiogi, 1984: 10). These same enterprises are less interested in graduates from liberal arts faculties. Thus, students in Japan are socialized from an early age to focus their studies on science and mathematics, attempt to enter the more prestigious universities, secure in the knowledge that if they are successful in this they will be recruited from the larger, more stable and lucrative Japanese businesses.

All of these studies are written by well known scholars of Japanese education, utilize sources in both Japanese and English, and document their conclusions thoroughly. It seems clear that there is a strong perception (and likely an accurate one) in Japan that there is a direct link between the nature of one's education and success in the business world, that the study of mathematics and science is more important and better rewarded than other pursuits, and that attending the more prestigious universities will result in successful career options.

Educational Achievement and Educational Administration

A sizeable number of the articles surveyed attributed the success of the Japanese educational system (and student achievement) to the manner in which the system is administered. A provocative study by Duke (1983) compares "Variations on Democratic Education: Divergent Patterns in Japan and America." Duke notes how the decentralized school governance pattern of the United States was introduced (some would say imposed) to Japan following the War and how from 1956 onward, the system gradually recentralized with power shifting back to the Ministry of Education (MOE) where it resides today. American educators associated with the Occupation assumed that the decentralized model was superior and more conducive to promoting achievement. Duke suggests (1983: 56), however, that the Japanese mix of European and North American management models has some distinct advantages: "...equality of opportunity to the Japanese Ministry of Education means establshing a uniform national academic standard through a standardized curriculum with its accompanying textbooks, and a set of teacher's guide to equalize the teaching methods as much as possible... Only under a nationally controlled system can national norms be effectively established..." And, with national norms more understanding as to what accounts for effective teaching and learning can be achieved.

A similar argument is made by Aoki and McCarthy (1984) in their study on "The Right to Education in Japan." In this study the legal basis for education in Japan is explored to highlight the unique governance structure of that system. The role of the MOE as an agency consciously promoting the modernization of the economy

is noted as is the relative homogeneity of Japanese society (1984: 446-447). This combination of factors leads the authors to conclude: "The interaction of the historical acceptance of centralized control of education and the legal doctrine of deferring to governmental authority in educational matters has undercut the early post-World War II local control reform. As a result, unlike the United States, determination and implementation of educational policies is highly centralized in Japan." (Aoki and McCarthy, 1984: 451). Like Duke, the authors of this study find the American and Japanese systems to be "moving towards a certain symmetry." (Aoki and McCarthy, 1984: 454); the U.S. moving toward standardization and centralization due to a concern for quality and Japan decentralizing by having a more active judiciary.

Edward Beauchamp, a respected authority on Japanese education, has also contributed two new studies on Japan's educational successes and the administration of education. In one study Beauchamp (1985a) traces the "democratization" of Japan's educational system. While acknowledging problem areas ("excessive pressures for examination achievement... discrimination against women and minorities... high degree of centralization."; (1985a: 36), he concludes that the manner in which Japanese education is democratically administered has allowed them "to have accomplished both relatively egalitarian access to basic education and the maintenance of very high academic standards in the context of providing training for democratic citizenship..." (Beauchamp, 1985a: 37).

In his second study, Beauchamp (1985b), compares educational reform traditions in Japan and the United States to demonstrate how all national educational systems are influenced to some degree by international borrowing. The administrative apparatus of the Japanese system, he concludes, is fundamentally different from that of the United States. Any effort to reform either system will have to take into account these significant differences. First, the geographical size differential is critical as local considerations play a much stronger role in the United States than in Japan (Beauchamp, 1985b: 32). Second, the centralized nature of Japanese education could not exist in the United States due to our federal system and deep rooted aversion to central control. Third, cultural and linguistic diversity is more pronounced in the United States than Japan (Beauchamp, 1985b: 33). Despite these pronounced differences, he notes that there is much that the United States can learn from Japan's successes; particularly, any educational reform effort in the United States must take into account the Japanese administrative model.

On a less macro and more popular level, two studies state that Japan's successes economically and in educational achievement are the direct result of the manner in which schools are managed. Schiller and Walberg (1982) call Japan a "Learning Society" and state that schools are organized in such a way as to enhance what they identify as seven productive factors in school learning: 1) ability; 2) development level; 3) motivation; 4) home learning environment; 5) quantity of instruction; 6) quality of instruction; 7) classroom social environment (Schiller and Walberg,

1982: 411-12). The authors conclude that the Japanese educational system has incentives enhancing each of these factors thus providing the institutional context in which high achievement can be fostered.

The argument presented by Aquila (1983) shifts the focus from Japanese schools to Japanese management practices in general. He urges American educators to adopt Japanese management practices and implement them in our schools (even though they are not used extensively in Japanese schools). He identifies seventeen innovations that if adopted would dramatically improve the quality of American education. These range from allowing teachers to "stop the assembly line," to instituting quality control circles (Aquila, 1983: 186). While he cautions against wholesale adoption of Japanese management practices, it is clear he views management as a key variable in Japanese economic and educational successes.

Two additional articles can be included in this category. Both focus on the positive role that Japanese educational television plays in promoting student achievement (Tiene, 1983; Tiene and Urakawa, 1983). In both articles the authors note the national effort being made in Japan to provide, nationwide, a first-rate educational television system. The Japanese have what is termed "massive TV penetration in [the] schools," (Tiene, 1983: 1983), excellent facilities (Tiene and Urakawa, 1983: 19), high quality research to back up the programming (Tiene and Urakawa, 1983: 20), "ingenious production techniques," (Tiene and Urakawa, 1983: 22), and excellent utilization by teachers and students (Tiene and Urakawa, 1983: 22). The authors contend that the national and local management of educational television of such high quality is

a major factor in educational achievement particularly at the elementary levels (Tiene and Urakawa, 1983: 21). They, of course, contrast the Japanese system with "the abysmal situation" in science education and educational television that exists in the United States.

In assessing the quality of the articles in this category, those by Duke, Beauchamp, and Aoki and McCarthy represent original data using both Japanese and Western sources. The authors are familiar with the language and culture of Japan, have long experience in conducting research in Japan, and are more conservative regarding Japan's economic and educational successes. By contrast, Tiene (Urakawa works for NHK, the Japanese national television network), Aquila, Schiller and Walberg have primarily written "reaction" pieces (reacting to a visit to Japan, recent collaboration with Japanese counterparts, etc.) more in a popular vein. There is little evidence of utilization of original sources although the research project referred to by Schiller and Walberg may yield some new data. These latter pieces are useful as perceptions of Japanese education by good observers but are somewhat too narrow to provide much explanation for Japan's educational successes. Taken as a whole what emerges from these studies is a descriptive picture of Japanese administrative and management practices in general, and how the educational system functions in particular. There is the underlying assumption that all of this contributes to Japanese educational success.

Curriculum and Educational Achievement

It is very tempting for educators and other social science

scholars to attribute student success in a particular subject to the way in which the content is structured and taught. This analysis has been made by some commentators on Japanese education as well. The following articles focus their attention on the Japanese curriculum as it specifically relates to science and mathematics education. In an early study of Japanese educational patterns in science and engineering a prominant scholar of Japanese science, Henry Birnbaum provides a detailed description of the Japanese educational system with particular emphasis on the science and engineering curriculum. In describing the course of study for a typical undergraduate major in science or engineering he makes clear at this relatively early date the systematic and solid core of courses required at the undergraduate level (Birnbaum, 1973: 1227).

The articles in this section, however, range widely in their use of data and sources. For example, one report by the National Science Foundation (1981) provides a brief synopsis of a 1980 report to the President of the United States on how the U.S. compares with other nations in science and mathematics education. The Japanese are judged superior in these two fields for the following reasons: 1) "...the number of degrees granted to engineers in recent years has surpassed the number granted in those same years in the U.S.." (NSF, 1981: 369). 2) "The large number of Japanese students who enter scientific fields (65 percent... versus 30 percent in the U.S.)." (NSF, 1981: 369). 3) "Mathematics instruction has a more rapid pace in Japan than in the U.S., and much higher proportion of students take the more advanced courses." (NSF, 1981: 370) The writers of this report make a similar

argument for Germany and the Soviet Union. For each of these nations, the report concludes that there has been a strong national committment "to quality science and mathematics instruction as an essential part of the pre-college educational process," (NSF, 1981: 370) while at the same time declaring that in the U.S., there has been a shrinking of our national committment.

Torrance (1982) argues that the Japanese school curriculum has other, perhaps unintended, outcomes that contribute to Japan's overall social and economic success. In his article on "Education for Quality Circles in Japanese Schools" he documenmts how both the formal and informal school curriculum allow "...Japanese children to receive practice and training in group or team creativity." (Torrance, 1982: 13). In discussing some elementary classes he visited he noted that groups of Japanese children were doing research on health habits and problems of other students (for which they had constructed a questionnaire, administered it, and were tabulating statistics), working on problems of improving the playing fields and playground, and improving the care and nurturing of the school animals (Torrance, 1982: 13). He concludes: "As I observed their behavior, I had little doubt but that as adults they would be effective memebers of Quality Circle groups. Already they had mastered and were practicing many of the requisite skills". (Torrance, 1982: 14). Thus, in his view, the organization of the Japanese elementary school curriculum is such that students are not only prepared well in mathematics and science, but are members of groups that apply their skills for functional reasons, thus preparing them for life in Japanese industry.

We have already discussed the curriculum results from the Stevenson et al. study (See particularly Stevenson et al. (in press) and Stigler et al., 1982) which indicated that Japanese students spend substantially more time during elementary school years studying mathematics, and as a consequence, learn more concepts and skills. There is also evidence from this study and others (e.g., Easley & Easley, 1983) that the ways in which Japanese children are taught mathematics differ from typical American teaching. While more time is apparently spent in whole class instruction in Japanese elementary classrooms, cooperative learning appears to be more prevalent and according to the Easleys, is more "horizontal" (children involved in connecting across different nuances and representations of the same concept). The subtleties of the distinctions are not extensively documented in any of the reports we have seen but existence of the differences is widely acknowledged.

We would have liked to find more in-depth examinations of the nature of the differences in curriculum approaches in secondary school years. Here we were handicapped by the limited information from earlier IEA studies beyond gross differences in amount of content covered and the unavailability at present of detailed analyses of cross-national differences in classroom processes that are forthcoming from the Second International Mathematics Study. There are, however, already some inklings that Japanese teachers' orientation toward mathematics is meaningfully different from that of American teachers. However, the comparative differences in content coverage might swamp the impact of process distinctions, making it difficult to pursue the

impact of process distinctions, making it difficult to pursue the consequences of these differences for academic achievement.

The Role of Culture in Educational Achievement in Japan

In much of the literature on Japan's social and economic successes, the writers refer to Japan's unique culture as a major factor. There is a subtle sense expressed in this literature that Japan's successes are, perhaps, culture specific and could not really be duplicated in any other society. These perceptions of Japan (held by both Japanese and Western scholars) are the focus of this section.

An introduction to this issue is provided by Tsukada (1984) who compares the Japanese and American experience and notes three aspects of considerable difference. The first aspect is the historical and cultural tendency toward centralization, or as the writer puts it: "...the public sector plays a monopolizing role in Japan..." (Tsukada, 1984: 12), in contrast to the vigorous role of the private sector in the United States.

A second major socio-cultural difference noted by Tsukuda relates to the varying sexual roles for females with respect to higher education in Japan and the United States. He states: "In Japan, females tended to be enrolled in junior colleges whereas females in the United States became equal to males, or even started exceeding males in the enrollment rate in four-year institutions in the United States." (Tsukuda, 1984: 12). His statistics for this statement are from both Japanese and American sources (Sorihu, (ed.) Nihon Tokei Nenkan: Japan Statistical Yearbook, 1984; and The United States Department of Education, National Center for

Educational Statistics, The Conditions of Education, Annually, 1984; respectively.)

Finally, the author notes the historical increase in the number of higher educational institutions in Japan as compared with the United States. Unlike the elementary and secondary sector referred to above and dominated by public controls, the private sector has played an important role in higher education; again, a phenomonen peculiar to Japan (Tsukuda, 1984: 12).

After documenting some differences with respect to educational expenditures and juvenile suicides and delinquency (Japan and the U.S. roughly equal in the first instance, and quite different in the second) Tsukuda concludes by stating that: " It can be said that both countries became similar to each other in terms of enrollment rate, expenditure for education, and the suicide rate, but not in terms of females' position in higher education, the role of the private sector in education and juvenile delinquency." (Tsukuda, 1984: 13). Despite the assertion that this study will employ a "comparative framework... to describe the characteristics of Japanese and American education statistically" (Tsukuda, 1984: 1) the notion that the two nations are socially and culturally unique continues to creep into the discussion.

Against this more or less factual description of Japanese and American education, three studies provide an interesting "perceptual" profile of the two systems. William Cummings, a well known scholar of Japanese education, has contributed an intriguing study of "Japanese Images of American Education" (1984). He perceptively notes that "Japan has been looking at American education much longer than America has been looking at

Japanese education, and Japan has far more information." (Cummings, 1984: 1). He discusses four observers of American education in Japan and their approach in conveying to the Japanese public their perceptions of American education: "Ministry of Education observers focus on aspects of finance, enrollments, and adminstration. Professors comment on the quality of academic life in the United States. Parents and students focus on events in the classroom and community. And politicians seem most aware of the American disease of drugs, violence, and sex. (Cummings, 1984: 11). Their view is one-dimensional depending on the interest group doing the viewing.

What emerges from Cummings" study is the cultural difference in interpreting a complex phenonomen such as "education." On the one hand, "...American education was seen as expressive, individualistic, opulent, and creative; on the other as undisciplined, wasteful, and hedonistic." (Cummings, 1984: 11). Generally speaking, Cummings concludes that the Japanese currently view American education in a negative light due perhaps to cultural tendencies but more likely to current political and economic successes.

Americans have also had a history of "discovering" and perceiving Japan and Japanese education. Ichikawa (1984) traces three stages of American perceptions of Japanese society and education: 1.) from the Occupation to the renewal of the US-Japan Security Treaty of 1960 (US belief that Japan was in need of radical educational reform to democratize the system) ;2.) 1960's-1970's (US admiration of Japan's economic growth); 3.) 1980's

(Japan becomes an economic rival and the educational system is given great credit). (Ichikawa, 1984: 2-3). As Ichikawa states: "At the same time [1970's-80], favorable results were shown by the International survey on Educational Achievement conducted by IEA." (Ichikawa, 1984: 3).

Ichikawa notes how American perceptions of Japanese education have become more accurate, statistically more informed, and generally more rigorous than in the past. Moreover, they have informed Japanese educators and stimulated various reforms. However, several caveats are in order due to a lack of understanding of Japanese culture: first, American scholars are hampered by limited sources of information, "Most of the visiting specialists depend for information mainly on publications in English, or Japanese people with communicative competence in foreign languages." (Ichikawa, 1984: 18); second, visiting specialists rely on secondhand information rather than comprehensive surveys; third, even if newspapers and other media are surveyed, this too can bias the foreign observer since journalism, according to Japanese culture, is commercial by nature and tend to "report sensationally" rather than objectively on educational news items (Ichikawa, 1984: 19). Finally, intellectuals tend to be anti-government and therefore overly critical of educational policy and practice. This is a cultural trait and not necessarily objectively accurate. Overall, the author concludes that the differences in Japanese and American culture are such that most attempts by American scholars to correctly interpret Japanese educational practices are compromised from the beginning. What emerges from American efforts to comment intelligently on Japanese

education are biased, ill-informed, and culturally irrelevant interpretations of Japan's educational policies and practices over the past thirty years.

Somewhat related to this line of thought is Kobayashi's (1984) study on tradition, modernization, and education in Japan which debunks many of the stereotypes held by most writers who seek to explain Japan's success economically and educationally. He acknowledges the many successes that the Japanese have achieved and the creative ways they have maintained aspects of their traditional culture in the face of rapid modernization (Kobayashi, 1984: 98-100). He introduces an ecological theoretical construct against which to discuss differences in American and Japanese pedagogy. What is perceived as rote learning by American observers in fact is part of a complex group interaction process inherent in Japanese culture: "This 'rote' is not really repetition since, from the practitioner's point of view, each 'repetition' is regarded as always containing learning something new, such as miniscule modifications in writing the kanji [Chinese characters] each time one does it..." (Kobayashi, 1984: 110).

The thrust of Kobayashi's argument is that contrary to many thinkers in the West, tradition and modernity are not mutually exclusive. In fact, aspects of Japanese tradition may contribute to their success in education:

> Thus, rote and imitation, practices deemed outmoded by new scientific theories of teaching-learning which entered education in Europe and America during the time of the industrial revolution, are still maintained in the teaching-learning of traditional arts in a nation considered the most modern and industrial in

> Asia. Planners in developing countries sometimes argue that "tradition" prevents modernization, but this doctrine is too simplistic, as the case of contemporary Japan illustrates. (Kobayashi, 1984: 113)

A final article in this section analyzes the college entrance examination (CEE) in Japan. The CEE has long been recognized as a major shaper of both elementary and secondary school experiences. Shimahara (1978) argues that the manner in which it is administered and the nature of the kind of pressures it exerts on students is unique to Japan. He views the CEE as "...an institutionalized practice compatible with the group orientation in Japanese society..." (Shimahara, 1978: 265). While being critical of the current CEE practice in Japan, he nevertheless notes how, due to the uniqueness of Japanese culture, it does serve several important functions:

1) It serves as a sorting device to assign students to certain groups in Japanese society;
2) It contributes to the political stability of Japanese society;
3) The drilling associated with the CEE helps instill basic knowledge at both the elementary and secondary levels (as well as disciplined behavior);
4) It has created an entire industry of tutoring and this has not only created employment for thousands of people but also additional educational experiences for most Japanese children;
5) CEE promotes an achievement orientation from an early age. (Shimahara, 1978: 262).

Shimahara believes the system should be changed due to the extraordinary pressures placed on students, but he and others who have studied the CEE in Japan recognize it as being imbedded in the deeper culture of the society and therefore not easily adopted by other cultures nor easily discarded.

The Critique.

All of the studies referred to above have in various ways lauded the Japanese system of education. Some have attributed Japanese educational successes to their striving for economic achievement; others have noted that their system works better than others because it is managed and administered better; some have documented that the curriculum organization and implementation at the precollegiate level is really the key to their comparative standing, and still others maintain that admittedly, they achieve at higher rates but that this can be attributed to cultural characteristics and is not likely to be duplicated elsewhere.

However, there is another body of literature that challenges many of these assumptions. In fact, these studies range from the mildly critical to those that morbidly suggest that Japanese education is in a state of absolute decline. In light of the exuberant praise for Japanese education on the one hand, or reluctant admiration on the other, it is worthwhile to examine the critical literature on Japanese education in order to place in perspective, the current debate on Japanese student achievement as it compares with the record in other nations.

The studies in this category eminate from both Western and Japanese scholars. Three articles from Western scholars are those by White (1984), Tobin (1984), and Rosenberg (1983). White provides an interesting tour through the Japanese educational system, a system she acknowledges produces superior educated products. However, she details the costs involved in achieving the educational successes so positively noted in the literature referred to above. The stress placed upon students by

parents and society to achieve has created what some psychotherapists refer to as "school phobia" (White, 1984: 99). "Japan does lead the world in school-related suicides for the 15-19 year old age group, at about 300 per year." (White, 1984: 100)

She also reports on the relatively new "battered teacher" and "battered parent" syndrome. Problems also exist in identifying superior intellect since the Japanese do not track students in the manner that we do. "The superbright may indeed be disadvantaged." (White, 1984: 100). She admits to problems related to stifling creativity in Japanese schools but insists that creativity is engendered in a different way than in the United States.

On the whole her critique is mild and tempered by her conclusion that "We should see Japan as establishing a new standard, not as a model to be emulated." (White, 1984: 101). In White's view, Japan is coping with her problems better than we are with ours.

More along the lines of popular stereotyping of Japan and its educational system (and problems) is the article by Rosenberg (1983). Here we see statements like: "...a visit to a Japanese campus is like a trip backward in time to a long forgotten day when authority was respected without questions and traditional values reigned... In Japan, achievement is all that counts... There are signs that Japan is paying a heavy price for the failure of its schools to foster the development of independence and creativity." (Rosenberg, 1983: 47,48,52). The tone of this article is that Japan succeeds but at an enormous cost.

Tobin (1984) summarizes some of the critical literature on Japanese education in an effort to demonstrate that American critiques of Japanese education are "...sometimes right, sometimes wrong, and always self-serving." (Tobin, 1984: 6). He notes that many writers idealize American education while being harshly realistic when discussing Japanese education. He maintains that much of the critical literature on Japanese education is culture-bound, narrowly focused (on such sensational topics as "examination hell", teenage suicide, school violence, concentrated on the top five per cent of the student cohort, and, "...tell us much more about our problems, our values, and about how we view our lives , than they tell us about Japan." (Tobin, 1983: 19). Finally, they almost always lack data upon which to base their wide-ranging assumptions about Japan's educational problems.

By way of contrast, Japanese commentators on their own educational system are much harsher and critical. Although their critiques range from mild to highly critical their tone is much less forgiving than that of their American counterparts. As Japan entered the 1980's, several governmental studies and conferences were held to assess the strengths and weaknesses of the entire Japanese educational system. These reassessments are summarized in Kobayashi (1980). The problems of the 1960's and 1970's (lack of quality in teaching, overexpansion of the educational system, what Ronald Dore called the "Diploma Disease", student alienation and unrest, etc.) have endured into the 1980's according to Kobayashi. Major tasks for this decade will be to create more flexibility in the system as a whole, further diversify higher education,

internationalize higher education in particular but the entire system in general, and generally improve the quality of the educational experiences of Japanese students (Kobayahsi, 1980: 242-44). To accomplish these tasks, Kobayashi suggests that a fundamental reform of Japanese education will have to be undertaken.

Amano (1984) provides a similar, more detailed reassessment of the Japanese educational "crisis" but distinguishes between a crisis "created" by politicians and one that is rooted in the structure of Japanese society (Amano, 1984: 3). At the secondary level, the most critical problem for Japan is the "selectiveness of admission under the universalized secondary school system." (Amano, 1984: 6). The rise of prestigious private prep schools, the declining prestige of vocational schools, and the increasing competition of the general public high school have created a host of problems for educators, students and parents alike. The pace of competition has not slackened over the years and in fact has increased. Japanese secondary education has become more hierarchical and this has resulted in a rigid curriculum, inequities, and psychological pressure (Amano, 1984: 12).

These problems are reflected as well at the higher educational level. Here problems center on increasingly difficult placement of graduates, low quality of undergraduate education, and the underdevelopment of graduate education (Amano, 1984: 18-19). Universities are also not responding to the needs of adult learners and the notion of "life-long learning" has not developed well in Japan. Amano concludes that higher education is the "weakest and

most problematic part of the Japanese educational system." (Amano, 1984: 21). His critique continues as he focusese attention on "examination hell" and the dysfunctional outcomes of this selection process. His discussion concludes with a criticism of "overstructurization" of Japanese society in general and education in particular. As the society becomes more differentiated, less equitable, the success function attributed to schools becomes more rigid and the greatest problem facing Japanese education in the future will be "the crisis of aspiration originating from an overstructuration of society" as increasing numbers of Japanese youth opt out of the system and "are not willing to join the competiton." (Amano, 1984: 31-32).

A more specific focus on "examination hell" is provided by Iga (1981). His study demonstrates how this system of examinations while producing high achievement results and economic successes creates enormous social and individual stress often resulting in suicide. He notes how a combination of family relations (overly strict family environment), the examination system, weak ego, and Japanese views of life, death and suicide all contribute to this particular outcome of Japan's urge to achieve (Iga, 1981: 26-29). Iga neither judges nor condemns this situation but simply concludes that: "It may be said that suicide is a more or less institutionalized adjustment mechanism in Japan." (Iga, 1981: 29).

A more ominous note is taken in the last article in this section by Kitamura (1984). He states that education as a whole in Japan is in a state of decline: financially, in terms of enrollments, and public trust. The number of dropouts (ochikobore) has increased dramatically at the primary and secondary levels,

absences are on the increase, as is school violence (Kitamura, 1984: 1-6). Another source of evidence for Japan's declining educational system is the increase in volume of criticism from abroad, particularly from the United States. Japanese educators are particularly sensitive to foreign criticism and in fact some reforms have been stimulated by this criticism. Finally, the need to develop a more "student-centered" educational system is also identified as a much needed reform for Japanese higher education (Kitamura, 1984: 34). The system from top to bottom is undergoing major changes according to Kitamura and critical reforms will be necessary to reverse this state of "decline."

Conclusion

Although reference has been made throughout this review regarding the quality of the research conducted on Japanese education, in conclusion some additional comments are in order more specifically on the quality of authorship, citations and sources of information.

In the section on education and economic development, one can only reiterate the high quality of both authorship and sources in the three studies discussed. Compared with studies in the other areas, there is convincing evidence that the need to achieve educationally is highly related to the national drive for economic growth and development. None of the studies, however, directly address this hypothesis and future studies might focus on this question.

The section on education and administration is a much more mixed picture. Some of the studies are of high quality in terms of

references and documentation and are written by distinguished Japan specialists (Duke, 1983; Aoki and McCarthy, 1984; and Beauchamp, 1985) but do not really test the assumption that Japanese educational achievement is a function of superior administrative experience. The articles by Schiller and Walberg (1982) and Aquila (1983) are more focused in this respect but lack the documentation and use of original sources. More interesting, perhaps, are the two articles on Japanese educational television (Tiene, 1983; and Tiene and Urakawa, 1983) because they focus on one specific sector of the Japanese educational system and provide us with more detailed information regarding a real educational experience. Overall, the arguement that Japan's management and administrative structure accounts to some degree for students' educational achievement appears one-dimensional.

Similarly, the studies surveyed that attempted to relate Japanese educational achievement with the unique nature and character of Japan's curriculum are also uni-dimensional. The best of these, however is that by Birnbaum (1973) which utilizes original sources and provides an informed and thoughtful study. Both the NSF (1981) and Torrance (1982) pieces are less convincing and tell us little about the role of curriculum in Japan's successes.

All of the studies surveyed in the section on culture and education are the products of some of the best scholars on Japanese education. All use original sources, have long familiarity with the country and culture and provide their readers with first-rate analysis of the links between Japanese

culture and education. One comes away from this set of studies much more informed about the complexity of Japanese society, the strength of its culture in the face of modernization, and the manner in which the educational system is imbued with traditional elements of Japanese culture. Japan emerges from these studies as a multi-dimensional society with elements that are both unique and comparable to other modernized and industrialized nations. What does not emerge from these studies, however, is any clear indication or data to explain the inordinantly high levels of achievement of Japanese students. Of course, none of the authors intended to discover this in their studies, yet all of them attribute some of the success the Japanese are having economically and educationally to the complex web of culture, tradition, and modernity.

The literature classified as "critique" is self-explanatory and rather than commenting on the nature of Japanese educational successes, focus attention on the costs and problems associated with the society and educational system. The most critical group are those from Japan who see the need for major reforms in the educational system. These are the people most intimately aware of Japan's educational system and perhaps for that reason, most critical. Whatever the Japanese educational system has accomplished by world standards has been at too dear a cost, according to this view, and major reforms will be necessary to redress problems with deep historical and cultural roots. These articles are well documented and provide more data than those in the other categories.

REFERENCES

Abdoo, F.B. (1984) "Music Education in Japan" Music Educator's Journal, 70(6), 52-56. (EJ293970)

Japanese children get 10 years of mandatory music studies, resulting in a population which can read music and appreciate it. History, theory, conducting, instrumental and choral performance, and reading and writing of music are taught. Japanese educators often criticize the approach as emphasizing the intellectual rather than the creative.

Allen, G.C. (March 1978) Education, Science and the Economic Development of Japan. Oxford Review of Education 4;1 27-36 (EJ182338)

Examines changes in the educational system of Japan from from 1868-1912 as a result of changes in attitudes toward science, technology, and professional and vocational training. Widespread fervor for utilitarian education during this period played a large part in Japan's commercial and industrial modernization.

Amano, I. (1984) The Socio-Political Background of Educational Crisis in Japan" paper presented at the EWC conference on Learning from Each Other.

Compares the "crisis" in education in both the US and Japan, focusing on the United States.

Anderson, A.M. (May 1982) "The Great Japanese IQ Increase," Nature, 279, 180-181.

Response to Lynn Nature (1982) article on increase in Japanese IQ. Attributes increase to post-war urbanization and economic growth and accompanying improvement in welfare, health, education and exposure to Western culture and ways of thought.

Aoki, K. & Mc Carthy, M. (July 1984) "The Right to Education in Japan," Journal of Law and Education, 13(3) 441-52. (EJ308288)

Reviews the governance of Japanese public schools since World War II. Unlike the United States, the Japanese government has centralized control of education, and the courts defer to government authority in educational matters.

Aquila, F.D. (May 1984) "Japanese Management in Schools: Boon or Boondoggle" Clearing House, 57(4), 180-186. (EJ292994)

Presents a series of approaches suggested by Japanese business management successes. Suggests ways several tenets of the Japanese system can be used in American school management.

Beauchamp, E. (1985) "Education" Chapter in Japan's Democracy, Ed. by E. Krauss and T. Ishida, Santa Barbara: Center for the Study of Institutions.

Study of education and democracy in Japan--equality and access

Beauchamp, E. (1985) "Reform Traditions in the United States and Japan," chapter in Education Policy in Crisis Ed. W. Cummings, New York Praeger.

Birnbaum, H. (Sept. 1973) "Japanese Educational Patterns in Science and Engineering," Science, 181; 4106; 1222-1227 (EJ085149)

Describes the Japanese educational system, and outlines some of the obstacles faced by students in progressing through successive levels from elementary school to university. Emphasizes undergraduate education, especially in science and engineering. The organization of the Japanese school system is schematically presented in a diagram.

Bock, R.D. & Spencer, B. (October, 1985). "On Statistical Standards of the Second International Mathematics Study", Conference on Statistical Standards for International Assessment of Student Achievement in Science and Mathematics, National Academy of Sciences.

Evaluation of the research design, data quality, and the analysis and reporting of the Second International Mathematics Study.

Bowman, M.J. (1981) Educational Choice and Labor Markets in Japan. Chicago: U. of Chicago Press.

Investigates relationship between educational stratification and job attainment in Japan using data from 1966-67 survey of Japanese males in last years of secondary school.

Chapey, G. (May 1983) Can We Learn a Lesson From Japan, Clearing House, 56(9), 394-96. (EJ280866)

Argues that American education could benefit from a look at the Japanese participative management system.

Crosswhite, F.J., Dossey, J.A., Swafford, J.O., McKnight, C.C., & Cooney, T.J. (1985). Second International Mathematics Study: Summary Report for the United States. Champaigne (Ill.): Stipes Publishing.

Summarizes the results from the Second International Mathematics Study in the United States.

Cogan, J.J. (March 1984) "Should the U.S. Mimic Japanese Education? Let's Look Before We Leap," Phi Delta Kappan, 462-468. (EJ294941)

Describes prospects of Japanese system of education that could and should be adopted by the U.S. and practices that should not be adopted.

Comber, L.C & Keeves, J.P. (1973) Science Achievement in Nineteen Countries. New York: John Wiley & Sons.

Reports the results from the Science Achievement Study part of the Six Subjects Survey conducted by the International Association for the Evaluation of Educational Achievement (IEA).

Conroy, M., R.D. Hess, H. Azuma, & K. Kashiwagi (June 1980) "Maternal Strategies for Regulating Children's Behavior," Cross-Cultural Psychology, 11(2), 153-172.

The strategies that Japanese and American mothers use to gain compliance from young children were compared. Six hypothetical compliance-relevant situations were described to 58 Japanese and 67 American mothers. Their responses were scored for the rationale or cognitive structure they offered as a basis for compliance and the flexibility of psychological space evident in their negotiations with the child. Japanese mothers were more likely to utilize feeling-oriented appeals and demonstrated greater flexibility than their American counterparts. American mothers relied more extensively on appeals to their authority as mothers. The cultural contexts that contribute to these different responses are discussed.

Cummings, W. (1980) Education and Equality in Japan. Princeton, NJ: Princeton University Press.

Study of Japanese schooling and its role in promoting greater equality of skills, modivation, and values of their pupils and contributes to leveling the social structures that youth enter.

Cummings, W. (1984) "Japanese Images of American Education," paper presented at the EWC conference on Learning from Each Other.

Analysis of the hidden agenda behind Japanese perceptions of US education.

Cummings, W. (1985) Educational Policy in Crisis: American and Japanese Perspectives, New York: Praeger.

This book focuses on reform traditions in the US and Japan.

Cunningham, S. (September 1984) "Cross-Cultural Study of Achievement Calls for Changes in Home", APA Monitor, 10. Reviews the study by Harold Stevenson and collegues of samples of First Grade and Fifth Grade students drawn from cities with similar characteristics in Japan (Sendai), Taiwan (Taipei) and the U.S. (Minneapolis).

Dickson, W.P., R.D. Hess, N. Miyake, & H. Azuma (1979) "Referential Communication Accuracy Between Mother and Child as a Predictor of Cognitive Development in the United States and Japan", Child Development, 50, 53-59.

Referential communication accuracy of mother-child pairs when children were 4 years old predicted children's cognitive development 1 and 2 years later in the United States and Japan. In a new communication task, the mother described 1 of a set of 4 pictures and the child tried to choose the picture described. In the second half of the task, mother and child reversed speaker-listener roles. communication accuracy for the pair was defined in terms of correctness of listener responses. Longitudinal measures of the child's cognative development included standardized readiness and intelligence tests. The predictive relationship between communication tasks provide a technique for measuring the accuracy of information exchange between parent and child. Research on communication skills and effects of parent-child interaction on cognitive socialization of children.

Duke, B. (1983) "Variations on Democratic Education Divergent Patterns in Japan and America," International Review of Education XXIX, 47-58.

US democratic influence on Japan and implications for education.

Easley, J. & Easley, E. (Oct-Dec 1983) "Horizontal Mathematics" Journal of Curriculum Studies, 15(4), 429-31 (EJ288873)

Japanese methods of teaching subtraction to first graders which emphasize the involvement of the children in developing and solving problems, are discussed. The conventional vertical format for solving problems was not introduced immedicately. Some results encountered by American teachers using these methods are also discussed.

Fetters, W.B., F.A. Owings, L.E. Suter, & R.T. Takai (April 1983) "Schooling Experiences a in Japan and the U.S.: A Cross-National Comparison of High School Students" Presented at the 1983 Annual Meeting of the American Educational Research Association, Montreal, Canada.

Reports on survey data on behavior, activites and attitudes of representative samples of 1980 Japanese and American high school seniors. Instrumentation was derived from the High

School and Beyond Study by the National center for Education Statistics.

Flynn, J.R. (February 1983) "Now the Great Augmentation of the American IQ", Nature, 301, 655.

Callenges Lyn's Nature article contention of increasing disparity between Japanese and American IQ. Cites differences in standardization samples over time, gains in American IQ, and Lynn's failure to include data from all comparable subtests.

Garmon, L. (July 10, 1982) "Japanese Jump," Science News, 122(2), 28-29. (EJ266165)

Recent studies are quoted as indicating that Japanese students are superior to American students in actual achievement in mathematics, but there is conflicting evidence as to whether the Japanese are intellectually superior. Several possible reasons for Japanese superiority are suggested, and a need for improvement in America is noted.

Harnisch, D.L., H.J. Walberg, S.L. Tsai, T. Sato, & L.J. Fyans, Jr. (in press) "Mathematics productivity in Japan and Illinois" in Evaluation in Education: International Progress, pp. 277-284.

The scores of 1,700 Japanese and 9,582 Illinois high school students on the High School Mathematics Test (containing 60 items on algebra, geometry, modern mathematics, data interpretation, and probability with an internal consistency reliability of .87) were regressed on background questionnaire measures of several factors in learning. Quantity of instruction and motivational variables emerge as the stronger statistically controlled correlates of mathematics achievement in both Japan and Illinois. In addition, older students did better than younger, and males outscored females in Japan. The two-standard-deviation achievement advantage of Japanese over Illinois students at three age levels dwarfs the differences within countries and may be attributable to unmeasured extramural factors as well as to superior quantity and quality of instruction in Japan.

Harnisch, D.L. (1983) "An Examination of Interaction Between Item Content and National Groups of Students for the United States and Japan" Paper presented at the annual meeting of the Mid=Western Educational Research Association, Kansas City.

The possibility that certain features of items on a mathematics achievement test may lead to biased estimates of the mathematics achievement of two particular cultural groups of students was investigated. Item response data from a 60-item high school mathematics test were obtained

from samples in Japan (N = 1700) and in the United States (N = 9582). Estimates of student ability were obtained for a combined data set which included a random sample of 1000 students from each country using the three-parameter logisitic model. Estimates of the item parameters were obtained separately for each country holding the ability estimates fixed. Bias indices were computed based on differences in item characteristic curves (ICCs) for the two national groups of students. Comparisons of content characteristics of items on the bias indices lead to the largest root sum-of squares being found with the geometry items. Items with the largest bias indices were further examined and discussed.

Harnisch, D.L. & T. Sato (October 1983) "Differences in Educational Influences and Achievement in Mathematics for Secondary Students in Japan and the United States" Paper presented at the ICMI-JSME Regional Conference on Mathematical Education, Tokyo.

The purpose of this investigation was to examine the relationship of mathematics achievement with various selected background and psychological variables for secondary students in Japan and the USA. Specifically, the significance and relative influence of individual (sex, self-esteem, motivation, etc.) and school and family variables (teacher coverage, parental influence) on mathematics achievement were investigated. The data used in this study came from the High School Mathematics Test (60-items) designed by ETS and administered to a national representative sample (N = 1700) of 16 year-olds in Japan and a second sample (N = 9582) of 16 year-olds from the Statewide Assessment Project of the Illinois State Board of Education. Multiple linear regressions of mathematics-test scores on the individual, family and school variables were performed separately by country. Results from the study indicated the strength of motivational measures in understanding the achievement for students in two of the highly developed countries of the world. Sex differences along with the quantity and quality of instruction variables were contributing significantly to variance in mathematics productivity. Comparisons of mathematics achievement were illustruated and were of substantial interest given the current concerns about the quality of education in the USA.

Harnisch, D.L. (1984) "Femalesand Mathematics: A Cross-National Perspective" Advances in Motivation and Achievement, 2, 73-91.

This chapter is concerned with sex differences in mathematics. Social, educational, and cultural barriers in many situations have prevented women from entering careers in science, engineering, and medicine. A brief description of the factors which limit the entry of women into specialized technical fields is presented. Literacy rates

of males and females are examined cross-nationally to provide a basic index of cognitive achievement. Sex differences in mathematics are reviewed with special emphasis given to the International Mathematics Studies sponsored by the International Association for the Evaluation of Educational Achievement. Data from three countries -- Japan, Sweden, and the United States -- participating in the First International Mathematics Study are reanalyzed to examine sex differences in mathematics performance and attitudes toward mathematics at each of the four socioeconomic levels. Substantial sex differences in mathematics achievement were found in Japan while moderate sex differences were found for Sweden and the United States only at the upper socioeconomic level. Sex differences in attitudes toward mathematics were generally quite small. Similar patterns of sex differences in attitudes toward mathematics were found for students in Japan and the United States on the activity which involves learning about units of measure. Sex differences in mathematics performance were examined for Japanese students in two international mathematics studies. Substantial sex differences were found in both studies. Sex differences in mathematics achievement based on the current categories of algebra and geometry were even more pronounced for the most recent international mathematics study. Given the results from the cross-national studies, various strategies are described for improving the participation and achievement of women in mathematics.

Harnisch, D.L. & K.E. Ryan (February 1985) "An Investigation of the Relationship of Achievement Motivation with Achievement in Mathematics for Students in the United States and Japan in Mid-Western Educational Researchers, 6, 5-21. (ED235886)

Hathaway, B. (September 1984) "Japanese Question Value of IQ Tests" APA Monitor, 11-12.

Reports on the diverse views of Japanese psychologysts and educational psychologists regarding the value of IQ tests.

Hess, R.D., H. Azuma, S.D. Holloway, & K. Kashiwagi (in press) "Cultural Variations in the Socialization of School Achievement: Contrasts Between Japan and the United States"

Studies of family effects on children's school-relevant skills usually involve SES or ethnic comparisons within Western cultures. This paper extends these cultural comparisons with results from a longitudinal study of family influences on school achievement in Japan and the United States. The initial project included 58 mothers and their 4-year-old children in Japan and 67 mothers and children in the United States. Data were gathered by interview, tests of mental ability, and three interaction tasks. A follow-up phase included 48 mothers and their 11-year old children in Japan and 47 mothers and their 12-year-old children in the

United States. Ten maternal variables from the preschool phase were selected to examine the association between maternal behavior and school readiness, at ages 5/6 and scores on tests of vocabulary and mathematics at follow-up. Maternal behavior was significantly related to both outcomes in both countries even after children's mental ability at age 4 was taken into account. The association increased in Japan but declined in the United States. Explanations are offered relating these trends to socialization patterns in the two cultures.

Hess, R.D., K. Kashiwagi, H. Azuma, & S.D. Holloway (unpublished) "Causal Attributions by Japanese and American Mothers and Children About Performance in Mathematics"

In this study we examined the possibility that causal inferences about performance may help explain the relatively superior achievement of Japanese students in mathematics. it was hypothesized that Japanese families view internal controllable sources, especially effort, as responsible for success, whereas families in the U.S. make attributions to external causes or, if to internal sources, to such uncontrollable factors as ability rather than effort. Data from mothers and children in Japan and the U.S. were examined for a) attributions about causes of performance in math; b) intra-family transmission of beliefs; and c) effect of sex of child on attributions. Results showed that Japanese mothers and children emphasized effort, particularly for low performance, while American mothers and children emphasized ability. Beliefs of mothers and children were similar within country but not within family, suggesting that transmission is diffuse. Differences in attributions about performance of boys and girls did not appear in Japan and in the U.S. appeared for mothers only. it was concluded that the value placed on achievement and attributions to effort as a cause of success offers a highly motivating context for Japanese students.

Hess, R.D., K. Kashiwagi, H. Azuma, G.G. Price, & P. Dickson (1980) "Maternal Expectations for Mastery of Developmental Tasks in Japan and the United States" International Journal of Psychology, 15, 259-271.

Reports data about maternal expectations derived from the collaboration by hess and Azuma on their cross-cultural longitudinal study of cognitive socialization and development.

Hess, R.D., S. Holloway, A. Wenegrat, H. Azuma, K. Kashiwagi, K. Miyake (June 1983) "Contrasts Between Japan and the United States in Family Influences on School Achievement: A Longitudinal Study"

Unpublished summary of the evidence on the effects of family influences on school achievement in the cross-national

longitudinal study of cognitive soicalization and developed carried out throught the collaboration of Hess and Azuma.

Hess, R.D., K. Kashiwagi, S. Nagano, K. Miyake, G. Hatano, H. Azuma, W.P. Dickson, S. Holloway, G. Price, T. McDevitt (October 1984) "Family Influences on School Readiness and Achievement in Japan and the United States: An Overview of a Longitudinal Study" to appear in H. Stevenson, H. Azuma, & K. Hakuta (Eds.), Child Development and Education in Japan, Freeman Publishers, 1985.

Overview of the results from the longitudinal study conducted collaboratively by Hess, Azuma, and their colleagues bearing on the influence of the family on cognitive development.

Husen, T. (Ed) (1976) International Study of Achievement in Mathematics: A Comparison of Twelve Countries. Vol. 1 & 2, New York: John Wiley & Sons.

Report on the First International Study of Mathematics conducted by the International Association for the Evaluation of Educational Achievement (IEA).

Ichikawa, S. (1984) "American Perceptions of Japanese Education," paper presented at the EWC Conference on Learning from Each Other.

Analysis of American experts on Japanese education.

Iga, M. (Spr 1981) "Suicide of Japanese Youth," Suicide and Life-Threatening Behavior, 11(1), 17-30. (EJ245434)

Discusses the uniquely intense stress in Japan due to the "Examination Hell" which contributes to a high rate of young suicide. The social structural factors are analyzed in terms of weak ego; restraint on aggression; lack of social resources; and views of life, death, and suicide.

Illinois State Board of Education (June 1985) Student Achievement in Illinois: An Analysis of Student Progress 1984, pp. 11-13.

Report of the results of the Mathematics Decade Study: Illinois and Japan. Random samples of 11th grade students in Illinois and Japan were administered a 60-item High School Mathematics Test developed by ETS. Japanese performance was substantially higher than Illinois performance for all age groups and all levels of a country's score distribution.

Kashiwagi, K. H. Azuma, & K. Miyake (1982) "Early Maternal Influences Upon Later Cognitive Development Among Japanese Children: A follow-up Study" in Japanese Psychological Research, 24(2), 90-100.

This is a follow-up on the Japanese sample of Japan-U.S. cross-national project concerning the maternal influence upon the cognitive development in pre-school study, IQ and school achievement scores were assessed at age 11:0 for 44 out of 58 Japanese sample, and were examined in relation to pre-school cognitive measures and to early maternal factors. As a general picture,the level of cognitive performance was moderately stable throughtout pre-school and school years. Non-verbal cognitive measures at pre-school age showed conspicuously high correlations with the present IQs, and the important role of non-verbal skills at early age was suggested as the basis of later cognitive development. The correlational patterns of early maternal factors with the present cognitive measures (at 11:0) were almost similar to those found in the pre-school study. These results suggest that environmental and maternal factors determine child's development not only in early age but also constitute long term and cumulative effects upon later cognitive development.

Kashiwagi, K., H. Azuma, K. Miyake, S. Nagano, R.D. Hess, & S.D. Holloway (1984) Japan-US Comparative Study on Early Maternal Influences Upon Cognitive Development: A Follow-up Study" in Japanese Psychological Research, 26(2), 82-92.

This is a comparative study on the follow-up samples of Japan-US cross-cultural project concerning maternal influences upon the cognitive development of children. In order to compare the longitudinal generalizability of our findings from preschool data, several cognitive measures assessed at 11:0 (Japan) or 12:0(US) were examined in relation to preschool measures and to early maternal variables. The level of performances were moderately stable throughout preschool and school period in both countries. Most of the present measures were highly correlated with soico-economic status (SES) and parental education in Japan, on the contrary, the correlations of demographic variables with child's measures diminished at school-age level in the U.S. The correlational patterns of early maternal factors with child's outcomes were generally maintained in nearly same fashion in both countries, but the relationships were stronger and tended to continue more persistently in Japan than in the U.S. The mechanisms of early environmental and maternal influences upon later child's cognative development were discussed in relation to socio-cultural background in the two countries.

Kelly, A. (1978) Girls and Science: An International Study of Sex Differences in School Science Achievement, IEA monograph, Studies No. 9, Stockholm: Almquist & Wiksell International.

Reports on secondary analyses of IEA Science Study Data that examines sex differences in science achievement and its possible explanations.

Kifer, E., Wolfe, R.G. & Schmidt, W.H. (1985) Cognitive Growth in Eight Counties: Lower Secondary School (Draft), Report to the Second International Mathematics Study, National Center for Education Statistics (Talk 5A) to appear in Student Growth and Classroom Processes in Early Secondary Schools, Second International Mathematics Study, Volume III.

Kirst, M.W. (June 1981) "Japanese Education: Its Implications For Economic Competition in the 1980s" Phi Delta Kappan, 707-708. (EJ245753)

Argues that Japanese schools are better equipped than their U.S. counterparts to prepare the workers of the furture but cautions that Japan's success has been purchased at a high price.

Katabe, K. (June 1985) Relationship in Japan Between Teachers' Instructional Ideologies and Students' Achievement in Mathematics; Report done for the International Studies in Education, Michigan State University.

Using Japanese data from Second International Mathematics Study, Katabe investigated the relationship between teachers' instructional ideologies or goals and students' achievement. He found that there was no significant relationship between what a teacher believes important in mathematics instruction and what and how much their students learn.

Kitamura, K. (1984) "Education in a State of Decline in Japan?" paper presented at the EWC conference on Learning from Each Other.

Analysis of dual nature of Japanese education; hi quality; low quality.

Kobayashi, T. (Oct. 1980) "Into the 1980's: The Japan Case" Comparative Education, 16(3), 237-44. (EJ235689)

Japanese education in the 1980's must strive to improve its quality. These challenges arise at the peak of the education system's quantitative expansion over the past two decades. Further effort must be directed toward diversification and internationalization, which should bring about a fundamental reorientation of Japanese schooling.

Kobayashi, V.N. (Fall 1984) "Tradition, Modernization, Education: The Case of Japan," Journal of Ethnic Studies, 12(3), 95-118. (EJ307897)

Analyzes Japan's success in avoiding many of the soicocultural problems affecting other modern countries. Explains Japan's ability to balance old and new, the domestic and the foreign, from an anthropological and educational perspective. Focuses on Japan's traditional pedagogical emphasis on rote and imitation.

Kurachi, A. (September 1984) "Reactions to an Incident Involving a Child in School, A Comparison of Japanese and American Mothers and Teachers' Reactions" Journal of Cross-Cultural Psychology, 15(3), 321-336.

Le Grand, K.R. (May 1981) "Perspective on Minority Education: An Interview with Anthropologist John Ogbu," Journal of Reading, 24(8), 680-86. (EJ245623)

Nigerian anthropologist John Ogbu examines the academic failure of minority groups within the context of American society and draws comparisons to minority group education in five other cultures (Great Britain, India, Isreal, Japan, and New Zealand).

Lynn, R. (1977) "The Intelligence of the Japanese" Bulliten for British Psychological Society; 30, 69-72.

Reviews of the results from standardization of Weschsler IG tests in Japan between 1950 and 1970 concludes that mean Japanese IQ exceeds American IQ in all age groups listed.

Lynn, R. & J. Dziobon (March 1979) "On the Intelligence of the Japanese and Other Mongoloid Peoples" in Person & Ind. Diff., 1, 95-96:

Reports results of administration of the American Primary Mental Abilities Test and a Japanese Intelligence Test to a sample of children in northern Ireland. The tests were calibrated against each other to compare mean IQ's in Japan and the U.S. results indicate average Japan children would obtain a mean IQ of approximately 109.

Lynn, R. (1982) "IQ in Japan and the United States Shows a Growing Disparity" Nature, 297, 222-223.

Reveiws results of standardization of WISC-R in Japan, interpreted in light of earlier standardization of Weschaler tests (reviewed in Lynn (1977)). Concludes that the disparity in mean IQ between Japan and the U.S. has grown by 7 points in a generation and the current high mean Japanese IQ has implications for there economic success.

Lynn, R. (1983) Untitled ("Lynn Replies"), Nature, 306, p. 292.

Reply to Stevenson and Azuma and to Flynn's critisism of Lynn's 1982 Nature article.

Makita, K. (1968) "The Rarity of Reading Disability in Japanese Children" American Jounal of Orthopsychiatry, 38, 599-613.

The study reported here indicates that the prevalence of dyslexia in Japan (0.98%) is some ten times lower than in Western countries. Transcultural epidemiology of reading disability is hardly found in psychiatric literature. No investigators refer to specific features of language and script, the direct object of reading behavior. It is proposed in this paper that the specificity of the used language is the most potent contributing factor in the formation of reading disability.

Minato, S. (1983) "Some Mathematical Attitudinal Data on Eighth Grade Students in Japan Measured by a Semanetic Differential" Educational Studies in Mathematics, 14, 19-38. (EJ276957)

In this study some atitudinal data on eighth grade students of a lower secondary school from administration of the MSD, which is the only SD type mathematical attitudinal instrument developed in Japan were reported. The data reported are the results of item analysis, reliability coefficients, factor analytic results, correlation between attitudes and achievement, and some sex-related difference statistics.

Mohs, N. (Sep. 1982) "IQ New Research Shows that the Japanese Outperform All Others," Discover, 3(9), 19-24. (EJ266244)

New research shows that Japanese achieved significantly higher average IQ scores than did their American counterparts. These results provide the focus of a discussion on the nature/nurture controversey, validity of using IQ scores in comparing mental capacity of races and nationality groups, and other factors related to intelligence testing.

Morimoto, T. (March 1982) "Contrasting Attitudes of Japanese and American Teachers," Educational Leadership, 39(6), 414. (EF259526)

Reports the results of a 1980 survey of teachers in Los Angeles and Tokyo. Selected findings: Japanese teachers identify with their schools and are committed to service while American teachers are more independent and view teaching as a job.

National Institute of Educational Research (1981) Mathematics Achievement of Secondary School Students, Second International Mathematics Study, National Report of Japan: Vol. I, (Tables and Figures), (as translated by K. Ishizaka) Tokyo, Japan.

National Institute of Educational Research (1982) Mathematics Achievement of Secondary School Students, Second International Mathematics Study, National Report of Japan: Vol. II, (Tables and Figures), (as translated by K. Ishizaka) Tokyo, Japan.

National Institute of Educational Research (1983) Mathematics Achievement of Secondary School Students, Second International Mathematics Study, National Report of Japan: Vol. III, (Tables and Figures), (as translated by K. Ishizaka) Tokyo, Japan.

Peaker, G.F. 1975) An Empirical Study in Twenty-one Countries: A Technical Report, Stockholm: Almquist & Wiksell International.

Reports on technical details of IEA Six Subjects Survey including information about sampling in Japan and the U.S..

Rohlen, T.P. (1983) Japan's High Schools. Berkeley, CA: University of California.

Anthropological study of Japanese five high schools of different types in City of Kobe done during years 1974-75. Rohlen uses his observations to characterize the functioning of Japanese upper secondary system providing a social ecology of the schools. The functioning of the high schools is described along several dimensions (space and time, organization, politics, instruction, adolescent patters), the ranking of high schoosl (as defined by their proportions of students accepted to university) is related to rates of delinquency, patterns of adoscent behavior, pace of learning, and the socioeconomic background of students' families and educational level of their parents. Rohlen relates these aspects of ademic stratification to broader picture of societal intent and its educational consequences.

Rohlen, T.P. (Winter 1986) "Japanese Education; If They Can Do It, Should We?", The American Scholar, 29-43.

Reviews and updates the findings from Rohlen (1983) and considers directly what features of the Japanese system would benefit American education and which aspects are not transferable, or should not be attempted.

Robitaille, D.F. & Taylor, A.R. (1985) A Comparative Review of Students' Achievements in the First and Second IEA Mathematics Studies, Report to the National Center for Education Statistics, Urbana, IL: University of Illinois.

Reports and discusses percentage of correct responses on items in common to both the First and Second IEA Mathematics Studies.

Rosenberg, N.S. (Feb. 1983) "Education in Japan: A Study in Contrasts," Independent School, 42(3), 47-53. (EJ276336)

Comparisons between Japanese and American education show that Japanese students are better behved and more conforming and do better on international math and science tests. Japanese education is more egailitarian in approach and funding, but its emphasis on examinations for getting into universities often puts great pressure on students.

Schiller, D. & Walberg, H.J. (March 1982) "Japan: The Learning Society." Educational Leadership, 39(6), 411-12. (EJ259525)

Japan's achievements are the results of an outstanding educational system that emphasizes quality of instruction, gives priority to children's learning, and rewards hard work.

Shimahara, N.K. (Oct. 1978) "Socialization for College Entrance Examinations in Japan" Comparative Education, 14(3), 253-66. (EJ199072)

This paper, based upon the author's research in Japan during 1976-77, discusses the pressures for shaping the socialization of Japanese adolescents and secondary schools to meet the reqirements of high school and college entrance examinations, which are a common source of chronic anxiety for students, parents, and teachers.

Shimahara, N.K. (Feb. 1985) "Japanese Education and Its Implications for US Education," Phi Delta Kappan, 66(6), 418-21. (EJ311757)

Japanese social values make education the central focus of most young peopl's lives, and make effort the most effective means of achieving success. Japanese education aims at egalitarianism, student motivation, and moral development. Some elements of Japan's educational success may be exportable, but others are too culturally determined.

Stevenson, H.W., J.W. Stigler, G.W. Lucker, & S. Lee (1982) "Reading Disabilities: The Case of Chinese, Japanese, and English" Child Development, 53, 1164-1181. (EJ274869)

A common hypothesis has considered apparent differences in the incidence of reading disability in Asian and Western languages to be related to orthographic factors. A reading test was constructed in English, Japanese, and Chinese to assess the validity of this proposal. Large samples of fifth-grade children in Japan, Taiwan, and the United States were given the test and a battery of 10 cognative tasks. Strong evidence was found that reading disabilities exist among Chinese and Japanese as well as among American children. In discriminating between groups of poor and average readers by means of the cognitive tasks, the combined effects of general information and verbal memory proved to be the most powerful predictors in Japan and Taiwan. General information and coding emerged as the most effective predictors for American children. The results cast doubt upon the crucial significance of orthography as the major factor determining the incidence of reading disabilities across cultures.

Stevenson, H.W. & H. Azuma (November 1983) "IQ in Japan and the United States" Nature,; 306, 291-292.

Response to Lynn's 1982 Nature article that claimed that the disparity in IQ between Japan and the U.S. was increasing. Stevenson and Azuma argue that the standardization plan for Japan and the U.S. were seriously non comparable as the Japanese sample was non representative of certain segments in their society.

Stevenson, H.W., S. Lee, J. Stigler, & G.W. Lucker (March 1984) "Family Variables and Reading: A Study of Mothers of Poor and Average Readers in Japan, Taiwan, and the United States" Journal of Learning Disabilities, 17(3), 150-156.

Mothers of poor and average readers in Japan, Taiwan and the United States were interviewed about their child-rearing practices, attitudes, and beliefs, and their children's current and earlier experiences. Poor readers represented the lowest fifth percentile in reading scores; they were matched by classroom, sex, and age with average readers; i.e., children who obtained reading scores within one standard deviation from the mean. The groups seldom differed significantly according to environmental variables and parent-child interactions. Maternal ratings of cognitive and achievement variables differentiated both the children in the two groups and the mothers themselves. Maternal beliefs and descriptions of how children use time also differed between the two groups. Notable was the absence of significant interactions between country and reading level.

Stevenson, H.W., J.W. Stigler, S. Lee, & G.W. Lucker (1985) "Cognitive Performance and Academic Achievement of Japanese, Chinese, and American Children" Child Development, 56, 718-734.

Chinese, Japanese, and American children at grades 1 and 5 were given a battery of 10 cognative tasks and tests of achievement in reading and mathematics. Samples consisted of 240 children in each grade in each culture. Two major purposes of the study were to determine possible differences in cognitive abilities of Jpanese, Chinese, and American children and to investigate the possible differential relation of scores on cognitive tasks to reading by children of the 3 cultures. Similarity was found among children of the three cultures in level, variability, and structure of cognitive abilities. Chinese children surpassed Japanese and American children in reading scores; both Chinese and Japanese children obtained higher scores in mathematics than the American children. Prediction of achievement scores from the cognitive tasks showed few differential effects among children of the 3 cultures. the results suggest that the high achievement of Chinese and Japanese children cannot be attributed to higher intellectual abilities, but must be related to experiences at home and at school.

Stigler, J.W., S. Lee, G.W. Lucker, & H.W. Stevenson (1982) "Curriculum and Achievement in Mathematics: A Study of Elementary School Children in Japan, Taiwan, and the United States, Journal of Educational Psychology, 74(3), 315-322. (EJ265341)

This article describes a method for constructing a test of mathematics achievement for use in cross-national study. The mathematics curricula as presented in elementary school textbook series from Japan, Taiwan, and the United States were analyzed according to the grade level at which various concepts and skills were introduced. The Japanese curriculum contained more concepts and skills and also introduced these concepts and skills earlier than the curricula of Taiwan and the United States. The curriculum was somewhat more advanced in the United States than in Taiwan. Details of the procedure used in constructing the mathematics test are described. The test was administered to 240 first-grade and 240 fifth-grade children randomly selected from 40 classrooms in each of the three countries. Children from Japan and Taiwan consistency performed at a higher level than their American counterparts. Level of achievement in elementary school mathematics appears not to be closely related to the content of the curriculum.

Tiene, D. (May 1983) "Japan Sets the Pace in Educaitonal Television," Educational Technology, 23(5), 18-22. (EJ288465)

The Ministry of Education and the Japanese Broadcasting Corporation (NKH) public television network are responsible for the instructional broadcasting that has penetrated Japan's classrooms at all levels. Implications for American television include stronger federal support for public television and the possible development of a national educational television system.

Tiene, D. & Urakawa, T. (Nov. 1983) "Japan's Elementary Science Series: The Chemistry of Successful ETV," Educational Technology, 23(11), 19-24. (EJ292008)

Provides a detailed look at combination of factors contributing to the success of the elementary science television programs of Japan, including production facilities, research, instructional approach, production techniques, and promotion. It is suggested that this series could serve as a model for the development of televised instruction in science elsewhere.

Tobin, J.J. (1984) American Images of Japanese Secondary and Higher Education. EWC conference on Learning from Each Other.

Analyzes American popular images of Japanese educational superiority.

Torrance, E.P. (Winter 1982) "Education for "Quality Circles" in Japanese Schools," Journal of Research and Development in Education, 15(2), 11-15. (EJ258794)

The Quality Circle is a simple management technique in which workers in the same production area meet to solve company problems. The Quality Circle has been applied to elementary and secondary schools in Japan to help students to develop creative problem solving skills and independent study skills. Recommendations are given for implementing Quality Circles in schools in the United States.

Torrance E.P. (Winter 1980) "Lessons About Giftedness and Creativity From a Nation of 115 Million Overachievers" Gifted Child Quarterly, 24(1), 10-14.

Reviews a diverse array of evidence (with limited citation) that Torrance claims are indicative of a high level of giftedness and creativity among the Japanese.

Travers, K. (October 1985). " The Second IEA Mathematics Study in the United States: Some Personal Reflections", Conference on Statistical Standards for International Assessment of Student Achievement in Science and Mathematics, National Academy of Sciences.

Observations about the Second International Mathematics Study as conducted in the United States by the Director of the U.S. National Coordinating Center and Chair of the International Mathematics Committee.

Tsukada, M. (1984) A Factual Overview of Education in Japan and the United States. EWC Learning from Each Other Conference

Examines 3 aspects of education: statistics; expenditures; and social problems.

Ushiogi, M. (1984) Transition from School to Work: Japanese Case. EWC conference on Learning from Each Other.

Educational expansion and impact on labor market; job recruitment.

Vining, D.R. (1983) "Mean IQ Differences in Japan and the United States" Nature, 301, 738.

Response to Lynn's (Nature 1982) interpretation of a growing disparity in IQ between Japan and the United States. Points to possible misrepresentation of proportion of high IQ Japanese.

Walberg, H.J. (1983) "Scientific Literacy and Economic Productivity in International Perspective" Daedalus, 112, 1-29.

Walberg, H.J. (February 1984) "Families as Partners in Education Productivity", Phi Delta Kappan, 397-400. (EJ293132)

The author discusses how cooperative partnerships between school and parents promote student achievement and have the potential to help resolve the crisis in educational productivity.

Walberg, H.J. (Oct. 1983) "We Can Raise Standards," Educational Leadership, 41(2), 4-6. (EJ286659)

Compares the educational productivity of the United States with that of Japan and explains how confusion of policies, lower standards, and demographic trends have contributed to this situation. States that, given the willpower, we can utilize research findings to increase our national achievement standards.

White, M.I. (Summer 1984) "Japanese Education: How Do They Do It?" Public Interest, 76, 87-101. (EJ302239)

The consensus among Japanese that education is important is the single most important contributor to the success of Japanese schools. Other factors include institutional centralization and centralized fiscal support, the valued role of maternal support, and the strong supportive learning atmosphere at home and in the classroom.

Wolfe, R.G. (1983) Processing of Selected Longitudinal Data Files, Second Study of Mathematics, Technical Report No. 1.

Reports pretest and posttest response patterns to all test items for countries participating in the longitudinal study part of the Second International Mathematical Study.

Wolf, R.M. (1983) "American Education: The Record is Mixed" Public Interest, 72, 124-132. (EJ283460)

Wolf contends that Lerner's article (based on Wolf's "Achievement in America") contains erroneous facts and interpretations and creates an incorrect impression of poor performance by American schools. Lerner replies that Wolf distorts data and ignores the issue of poor achievement by attributing decline in academic standards to "opportunity to learn."

Weisz, J.R., F.M. Rothbaum, & T.C. Blackburn (September 1984) "Standing Out and Standing In, The Psychology of Control in America and Japan" American Psychologist, 39(9), 955-969.

There are at least two general parts to a feeling of control. In primary control, individuals enhance their rewards by influencing existing realities (e.g., other people, circumstances, symptoms, or behavior problems). In secondary control, individuals enhance their rewards by accommodating to existing realities and maximizing satisfaction or goodness to fit with things as they are. American psychologists have written extensively about control, but have generally defined it only in terms of its primary form. This, we argue, reflects a cultural context in which primary control is heavily emphasized and highly valued. In Japan, by contrast, primary control has traditionally been less highly valued and less often anticipated, and secondary control has assumed a more central role in everyday life than in our own culture. To illustrate this cross-cultural difference, we contrast Japanese and American perspectives and practices in child rearing, socialization, religion and philosophy, work, and psychotherapy. These Japanese/American comparisons reveal some key benefits, and some costs, of both primary and secondary approaches to control. In the process, the comparisons reveal the disadvantages of a one-sided pursuit

of either form of control. They suggest that an important goal, both for individuals and for cultures, is an optimally adaptive blend of primary and secondary control, a goal best achieved with one's cultural blinders removed.

Yao, E.L. & Kierstead, F.D. (Dec 1984) "Can Asian Educational Systems be Models for American Education? An Appraisal," NASSP Bulletin, 68(476), 82-89. (EJ311639)

Reviews current Asian educational systems, pointing out that comparison with the United States system is not possible. the educational systems reflect the societies' needs, which differ from culture to culture.

Youth Development Headquarters. (1984) The Japanese Youth : In Comparison with the Youth in the World. Prime Minister's Office of Japan: The Youth Development Headquarters.

Reports finding of the "World Youth Survey" conducted in 1983 by the Youth Development Headqarters, Prime Minister's Office. Previous surveys carried out in 1972 and 1977. The purpos of teh survey was to determine major problems confronting young people in Japan to provide guidance for furture youth policy, and provide data that would promote mutual understanding about youth in Japan and in foreign countries.

_____ (Feb. 1981) "How the US Compares with Other Countries," Educational Leadership, 38(5), 368-70. (EJ242308)

A report from the National Science Foundation supports the contention that the United States lags behind the Soviet Union, Japan, and Germany in science and mathematics education.

Table 1. Sources of data on the cognitive characteristics of Japanese students.

Source	Dates	Age/ Grade	Type of Measure
IEA First International Mathematics Study	1964	13 years	Mathematics (Lower Process, Higher Process, Word Problems, Computational, New Mathematics, Basic Arithmetic, Advanced Arithmetic, Algebra, Geometry)
		Grade 12	Mathematics (Lower Process, Higher Process, Word Problems, Computational, New Mathematics, Algebra, Geometry, Analytical Geometry, Calculus, Analysis, Sets, Logic)
IEA Six Subjects Survey	1969-1970	10 years 14 years	Science (Earth Science, Biology, Chemistry, Physics, Practical (14 only), Behavioral Levels, Test of Understanding of Science)
IEA Second International Mathematics Study	1980-1981 (Japan) 1981-1982 (U.S.)	Grades 7-8 (Japan) Grade 8 (U.S.)	Mathematics (Arithmetic Fractions, Ratio, Proportion, and Percent), Algebra (Integers, Formulas and Equations), Geometry, Measurement, Statistics)
		Grade 12	Mathematics (Sets & Relations, Number Systems, Algebra, Geometry, Elementary Functions/Calculus, Probability and Statistics, Finite Math)
Harnisch/ Sato	1981-1982	Grade 11	High School Mathematics Test (ETS) (Algebra, Geometry, Modern Math, Data Interpretation, Probability)
Stevenson et al.	1979-1981	Kindergarten	Letter and Word Recognition Comprehension
		Grade 1 Grade 5	Cognitive Tasks (Coding Spatial Relations, Percetual Speed, Auditory Memory, Serial Memory for Words, Serial Memory for Numbers, Verbal Spatial Representation, Verbal Memory, Vocabulary, General Information)

Source	Dates	Age/ Grade	Type of Measure
			Reading (Sight Reading of Vocabulary, Reading of Textual Material, Comprehension of Text) Mathematics (Concepts Skills, Computation, Word Problems)
Hess/Azuma	1972-1977	3 years 8 months	Concept Familiary Index Peabody Picture Vocabulary Test
		4	Block Sort Task Referential Communication
		5	School Readiness Test
		6	School Readiness Test, IQ
		11(Japan)	WISC-R(Japan) Achievement Ratings by Teachers in School Subjects (Japan)
		12(U.S.)	Iowa Test of Basic Skills (U.S.) Achievement Ratings by Teachers in Reading and Mathematics
Lynn	1975	6-16	WISC-R IQ

Table 2. Descriptive statistics on the performance of Japanese and American Students from the First International Mathematics Study.(a)

Population	Country	Mean	Standard Deviation	Number of Cases
1a (13-yr-olds)	Intern'l(b)	19.8(c)	14.9	27,228
	Japan	31.2	16.9	2,050
	U.S.A.	16.2	13.3	6,231
3b (Non-math specialist, pre-univ.)	Intern'l	21.0	12.8	12,828
	Japan	25.3	14.3	4,372
	U.S.A	8.3	9.0	2,042
3a (Math specialist, pre-univ.)	Intern'l	26.1	13.8	9,007
	Japan	31.4	14.8	818
	U.S.A.	13.8	12.6	1,568

Notes:

(a) The source of these data are Tables 1.1, 1.3, and 1.5 from Volume II of Husen (1976, pp. 24-27). These scores have been corrected for guessing.

(b) The figures in the rows labeled "Intern'l" are derived from the score distributions for students pooled across all countries.

(c) The tests for populations 1a, 3b, and 3a contained 70, 58, and 69 items, respectively.

Table 3. Subscores expressed as standard score of 13-year-old students (Population 1a) for Japan and the United States, ordered according to the largest standard score in Japan.(a)

Subscore	Number of Items	Japan Standard Score(b)	Japan Rank(c)	U.S.A. Standard Score(b)	U.S.A. Rank(c)
Adv. Arithmetic	14	.82	1	-.20	10
Lower Process	49	.77	1	-.22	10
Total	70	.76	1	-.25	10
Word Probs.	41	.76	1	-.29	11
Geometry	17	.75	1	-.37	11
Computation	29	.69	1	-.16	10
Algebra	17	.62	1	-.23	9
Higher Process	21	.59	1	-.27	11
Basic Arithmetic	18	.50	2	-.10	9
New Mathematics	13	.36	3	-.09	9

Notes:

(a) These data are taken from Table 1.7 in Husen (1976, Vol II, p. 32).

(b) Standard scores were derived by subtracting the grand mean of all pupils tested from the country's mean on the test and then dividing by the standard deviation of all pupils.

(c) Eleven countries tested students at Population 1a.

Table 4. Subscores expressed as standard scores of non-mathematics students in final year of secondary school (Population 3b) for Japan and U.S.A., ordered according to the largest standard score in Japan. (First International Mathematics Study) (a)

		Japan		U.S.A.	
Subscore	Number of Items	Standard Score	Rank(c)	Standard Score(b)	Rank(c)
Adv. Arithmetic	6	.44	1	-.91	8
Total	58	.34	2	-.99	8
Analysis	6	.33	1	-.51	7
Lower Process	34	.32	3	-.99	8
Higher Process	24	.32	2	-.88	8
Word Prolems	39	.32	2	-1.01	8
Computation	19	.32	3	-.81	7
New Mathematics	10	.32	2	-.74	8
Analytical Geom.	<5	.27	4	-.62	7
Geometry	15	.24	4	-.96	8
Sets	5	.22	1	-.50	7
Algebra	15	.19	3	-.90	8

Notes:

(a) These data are taken from Table 1.10 in Husen (1976, Vol II, p. 34).

(b) Standard scores were derived by subtracting the grand mean of all pupils tested from the country's mean on the test and then dividing by the standard deviation of all pupils.

(c) Eight countries tested students at population 3b.

Table 5. Subscores expressed as standard scores of mathematics students in final year of secondary school (Population 3a) for Japan and U.S.A., ordered according to the largest standard score in Japan. (First International Mathematics Study)(a)

		Japan		U.S.A.	
Subscore	Number of Items	Standard Score	Rank(c)	Standard Score(b)	Rank(c)
Analysis	13	.61	3	-.79	12
Word Problems	31	.41	3	-.77	12
Geometry	5	.40	2	-.69	12
Total	69	.38	6	-.90	12
Lower Process	41	.36	6	-.94	12
Higher Process	28	.36	5	-.70	12
New Mathematics	17	.34	4	-.29	11
Computation	38	.33	6	-.91	12
Analytical Geom.	5	.32	7	-.34	12
Algebra	19	.30	5	-.81	12
Sets	5	.28	3	-.05	7
Logic	6	-.01	6	.00	5
Calculus	9	-.06	8	-.90	12

Notes:

(a) These data are taken from Table 1.9 in Husen (1976, Vol II, p. 33).

(b) Standard scores were derived by subtracting the grand mean of all pupils tested from the country's mean on the test and then dividing by the standard deviation of all pupils.

(c) Twelve countries tested students at population 3a.

Table 6. Descriptive statistics for total science scores for Japan and the United States from the IEA Science Study. (a)

Population	Country	Mean(b)	Standard Deviation(b)	Number of Cases(c)
10-year-olds	Intern'l(d)	16.7	7.9	--
	Japan	21.7(1)	7.7(7)	2,467
	U.S.A.	17.7(4)	9.3(1)	5,431
14-year-olds	Intern'l	22.3	11.8	--
	Japan	31.2(1)	14.8(1)	1,946
	U.S.A	21.6(8)	11.6(8)	3,398

Notes:

(a) The test score data are taken from Table 7.2 (p. 159) in Comber and Keeves (1973).

(b) Both means and standard deviations are based test scores corrected for guessing. Only developed contries (12 at Population I and 14 at Population II) are included in deriving the country ranks.

(c) The number of students corresponds to the figures for achieved samples reported in Table 3.1 (p. 45) in Comber and Keeves (1973).

(d) International means and standard deviations are those reported in Table 7.2 (p. 159) of Comber and Keeves (1973). Although not explicitly stated, these values as presumably averages (corrected for guessing) over all pupils tested.

Table 7. Standardized subtest performance of Japanese and American students from the IEA Science Study(a)

Pop.	Subtest	Number of items	Intern'l S.D. (b)	Japan Score(c)	U.S.A. Score(c)
10-year-olds	Biology	13	2.96	.64(1)	-.10(7)
	Earth Science/Chem	13	3.03	.38(1)	.07(5)
	Physics	14	3.43	.58(1)	.33(2)
	Information	11	2.46	.22(3)	.20(4)
	Understanding	14	3.32	.72(1)	.11(3)
	Applications	9	2.38	.48(1)	-.08(8)
	Higher Processes	6	1.75	.56(1)	.23(2)
14-year-olds	Biology	19	3.33	.46(2)	.12(5)
	Chemistry	19	3.55	.62(1)	-.07(7)
	Physics	22	4.44	.72(1)	-.11(7)
	Practical	20	3.48	.49(1)	-.33(9)
	Information	17	3.00	.24(2)	-.03(7)
	Understanding	22	4.26	.86(1)	-.09(9)
	Applications	12	2.52	.55(1)	.02(6)
	Higher Processes	9	2.06	.66(1)	.01(6)

Notes:

(a) These data are taken from Tables 6.1, 6.2, 6.4, and 6.5 (pp. 119-123) in Comber and Keeves (1973).

(b) The standard deviations are the unweighted averages of the national standard deviations from the developed countries. These numbers do not necessarily correspond to the standard deviations pooled across pupils from all developed countries.

(c) According to Comber and Keeves (1973, pp. 118-119), a country's standardized subtest score is determined by deviating the country's mean from the unweighted average of the mean scores of the students in each of the developed countries and then dividing by the unweighted average of the national standard deviations of the developed countries (column 3). Before averaging, students scores were weighted and corrected for guessing.

(d) The ranks are based on comparisons with developed countries only. There were 12 developed countries participating at Population I and 14 at Population II.

Table 8. Sex differences in science performance for Japan and the United States from the IEA Science Study(a)

Subject	Japan Girls Score(b) (Rank)(c)	Japan Boys Score(b) (Rank)(c)	Japan SSD(d)	U.S.A. Girls Score(b) (Rank)(c)	U.S.A. Boys Score(b) (Rank)(c)	U.S.A. SSD(d)	Intn'l Mean SSD
10-year-olds:							
Total	21.1(2)	22.3(1)	15	17.0(12)	18.6(5)	18	25
Biology	7.4(2)	7.5(1)	17	5.2(16)	5.3(15)	3	4
Chemistry	1.1(15)	1.3(11)	17	1.3(14)	1.3(13)	3	3
Physics	7.0(3)	7.8(1)	27	6.0(7)	7.1(2)	29	41
Earth Sc.	5.7(2)	5.9(1)	6	4.7(11)	5.0(5)	14	17
14-year-olds:							
Total	27.1(4)	35.3(1)	55	9.9(20)	12.7(10)	42	48
Biology	6.7(4)	8.1(3)	34	6.0(13)	6.5(5)	15	13
Chemistry	5.5(4)	6.7(1)	29	3.3(22)	4.1(12)	24	21
Physics	10.7(5)	13.9(1)	61	7.4(22)	9.5(11)	52	61
Practical	4.2(9)	6.7(1)	60	2.8(21)	4.1(10)	40	50

Notes:

(a) These data are from Appendices AV.I and AV.II (pp.120-125) from Kelly (1978).

(b) The scores reported are weighted and corrected for guessing.

(c) The ranks are based on treating girls and boys as separate samples for each developed country. Thus the ranks are out of 24 for Population I and 28 for Population II.

(d) The standardized sex differences reported by Kelly are derived by multiplying the difference between girls' and boys' scores by 100 and dividing by the country's standard deviation. These figures differ from the standardized sex differences reported by Comber and Keeves (1973, pp. 143-145) who divided all sex differences by the average standard deviation for all countries.

Table 9. Average percent correct at posttest on items from major content topics for Japan and the United States (Second International Mathematics Study).(a)

Pop.	Content Topic (No. of Items)	Japan	U.S.A.	Intern'l Mean
A	Arithmetic (46)	61	51	50
	Algebra (30)	61	43	43
	Geometry (40)	60	38	41
	Measurement (24)	69	42	51
	Statistics (18)	71	57	55
B	Sets & Relations (7)	79	59	62
	Number systems (17)	72	45	50
	Algebra (26)	76	48	57
	Geometry (26)	58	37	42
	Elementary Func/Calc (46)	69	36	44
	Probability & Statistics (7)	72	45	50
	Finite Mathematics (4)	76	36	44

Notes:

(a) The Japnese data are taken from Tables 1.6 & 1.7 of Volume I from the national Report prepared by the National Institute for Educational Research (1981, as translated by Ishizaka). The U.S. data and the International means are taken from Tables 4 and 28 of the U.S. Summary Report (September 1984 version). There may be a discrepancy in terms of the items on which the scores are based. The number of items at Population A correspond to the number administered in both countries at the posttest (as derived from Wolfe, 1983).

Table 10. Average percent correct at posttest and change in percent correct from pretest to posttest in Japan and the United States for SIMS Population A. (a)

	Japan		U.S.A.	
Topic (No. of items)(b)	Posttest(c)	Pre-Post Change(d)	Posttest(c)	Pre-Post Change(d)
Arithemtic				
Whole numbers (10)	69	10(3)	60	1
Common Fractions (8)	66	7(4)	53	9
Decimal Fractions (10)	62	6(4)	41	10
Ratio & Percent (8)	54	2	48	9
Number Theory (3)	74	3(1)	52	6
Powers (3)	67	21(1)	55	10
Square Roots (3)	12	-	44	-
Number System (1)	68	-	63	-
Algebra				
Integers (5)	71	24(3)	52	11
Rationals (1)	68	31(1)	54	12
Integer Exponents (2)	26	-	26	-
Formulas (8)	65	46(2)	42	12
Polynomial Exp. (2)	67	42(1)	43	19
Equalities & Inequal (8)	59	33(3)	47	9
Relations (3)	63	25(2)	46	10
Sets (1)	37	2(1)	25	2
Geometry				
Classification (4)	69	-	50	-
Properties (9)	69	11(4)	39	8
Congruence (3)	73	-	39	8
Similarities (4)	62	6(1)	41	10
Geometric Construc. (1)	34	-	24	-
Pythagrorean Theorem (2)	23	-	27	-
Coordinates (5)	48	32(3)	36	10
Deductions (2)	56	-	27	-
Informal Tansformation(4)	68	-	49	-
Spatial Visualization (2)	85	9(2)	43	5
Transformational Geom.(4)	30	5(1)	25	10
Measurement				
Units (5)	80	-	53	-
Estimation (6)	75	7(3)	51	6
Approximations (3)	60	4(1)	48	12
Determining Measures (10)	64	3(4)	28	5

Topic (No. of items)(b)	Japan Posttest(c)	Japan Pre-Post Change(d)	U.S.A. Posttest(c)	U.S.A. Pre-Post Change(d)
Statistics				
Unclassified (1)	74	-	76	-
Organization (3)	55	-	59	-
Representation (7)	76	4(3)	61	6
Central Tendency (6)	77	3(2)	58	2
Probability (1)	46	-	46	-

Notes:

(a) The data are taken from Wolfe (1983).

(b) The number of items is the number on which both Japan and the United States provided posttest data.

(c) The posttest averages are based on all items on which both Japan and the U.S. provided data.

(d) The pre-post change is the difference between the posttest percent correct for an item and the corresponding pretest percent correct for all items which were given on both occasions in both Japan and the U.S. The number in parenthesis is the number of items on which the change measure is based for Japan. The U.S. change measure is based on the same subset of items.

Table 11. Average percent correct by content topics behavioral on common FIMS/SIMS categories items for Japan and the United States (Population A).(a)

		Japan			U.S.A.		
Topic	No. of Items	FIMS	SIMS	Change	FIMS	SIMS	Change
Overall	36	64	64	0	48	43	-3
Arithmetic	14	65	60	-5	55	49	-6
Algebra	10	53	59	+6	40	41	+1
Geometry	5	67	68	+1	40	34	-6
Statistics	5	78	72	-6	57	54	-3
Measurement	2	73	74	+1	35	37	+2
Computation	13	64	67	+3	50	48	-2
Understanding	11	56	55	-1	50	46	-4
Applications	9	74	69	-5	48	44	-4
Analysis	3	63	65	+2	32	28	-4
Computational	20	60	63	+3	-	-	-(b)
Word Problems	16	69	65	-4	-	-	-

Notes:

(a) The Japanese data are taken from Tables 1.20a and 1.20b from the National Institute for Educational Research (1981). The U.S. data are taken from Tables 4 and 28 of the U.S. Summary Report (September 1984 revision). There may be a discrepancy in terms of the items on which the scores are based. One item included in the Japanese report was deleted because corresponding information was not available for the u.S. FIMS. The values reported also diverge from those contained in Robitaille and Taylor (1985).

(b) The U.S. summary report did not classify items in this manner.

Table 12. Average percent correct by content topics on common FIMS/SIMS items for Japan and the United States (Population B).(a)

		Japan			U.S.A.		
Topic	No. of Items	FIMS	SIMS	Change	FIMS	SIMS	Change
Overall	19(b)	61	76	+15	38	43	+5
Sets & Relations	1	25	91	+66	32	59	+27
Number System	1	85	92	+7	58	62	+4
Algebra	3	73	78	+5	51	50	-1
Geometry	4	70	80	+10	42	41	-1
Elementary Functions/ Calculus	9(b)	54	70	+16	30	38	+8
Probability & Statistics	1	61	87	+26	53	53	0
Computation	6	73	86	+13	-	-	-(d)
Understanding	6	53	73	+20	-	-	-(d)
Applications	7	57	71	+15	-	-	-(d)
Computational	14	56	75	+19	-	-	-(d)
Word Problems	5	74	81	+7	-	-	-(d)

Notes:

(a) The Japanese data are taken from Tables 1.21a and 1.21b from the National Institute for Educational Research (1981). The U.S. data are taken from Tables 4 and 28 of the U.S. Summary Report (September 1984 revision). There may be a discrepancy in terms of the items on which the scores are based. One item included in the Japanese report was deleted because corresponding information was not available for the U.S. FIMS. The values reported also diverge from those contained in Robitaille and Taylor (1985).

(b) The U.S. Summary Report states that 10 items (20 items overall) on Elementary Functions/Calculus were in common for FIMS/SIMS. Robitaille and Taylor identified only 18 common items. We were unable to determine the reason for this discrepency at this time.

(c) Performance by behavioral category and verbal/non-verbal was not reported for Population B in the U.S. Summary Report.

Table 13. Differences in performance between Japan and the United States on cognitive measures administered in Grades 1 and 5 in the Stevenson etal. study.(a)

Cognitive Measure	Standard Scores(b) 1st Grade Japan Higher	1st Grade U.S.A. Higher	5th Grade Japan Higher	5th Grade U.S.A. Higher
Cognitive Ability Task				
Coding	-	.14	-	.24
Spatial Relations	.33	-	.47	-
Perceptual Speed	-	.68	.18	-
Auditory Memory	.28	-	.48	-
Serial Memory for Words	-	.55	-	.25
Serial Memory for Numbers	-	.63	-	.34
Verbal Spatial Rep.	.13	-	.12	-
Verbal Memory	-	.39	-	1.41
Vocabulary	-	.77	-	.12
General Information	-	.54	.19	-
Reading				
Sight Reading of Vocabulary	-	.29	-	.16
Reading of Textual Material	-	.06	-	-
Comprehension	.08	-	-	.01
Mathematics (total)	.55	-	1.42	-

Notes:

(a) These data are reported in greatest detail in Stevenson et al. (1985).

(b) Standard scores were determined by dividing the differences in means between Japan and the United States by the standard deviation of the United States scores for the data reported in Tables 3 and 6 from Stevenson et al. (1985).